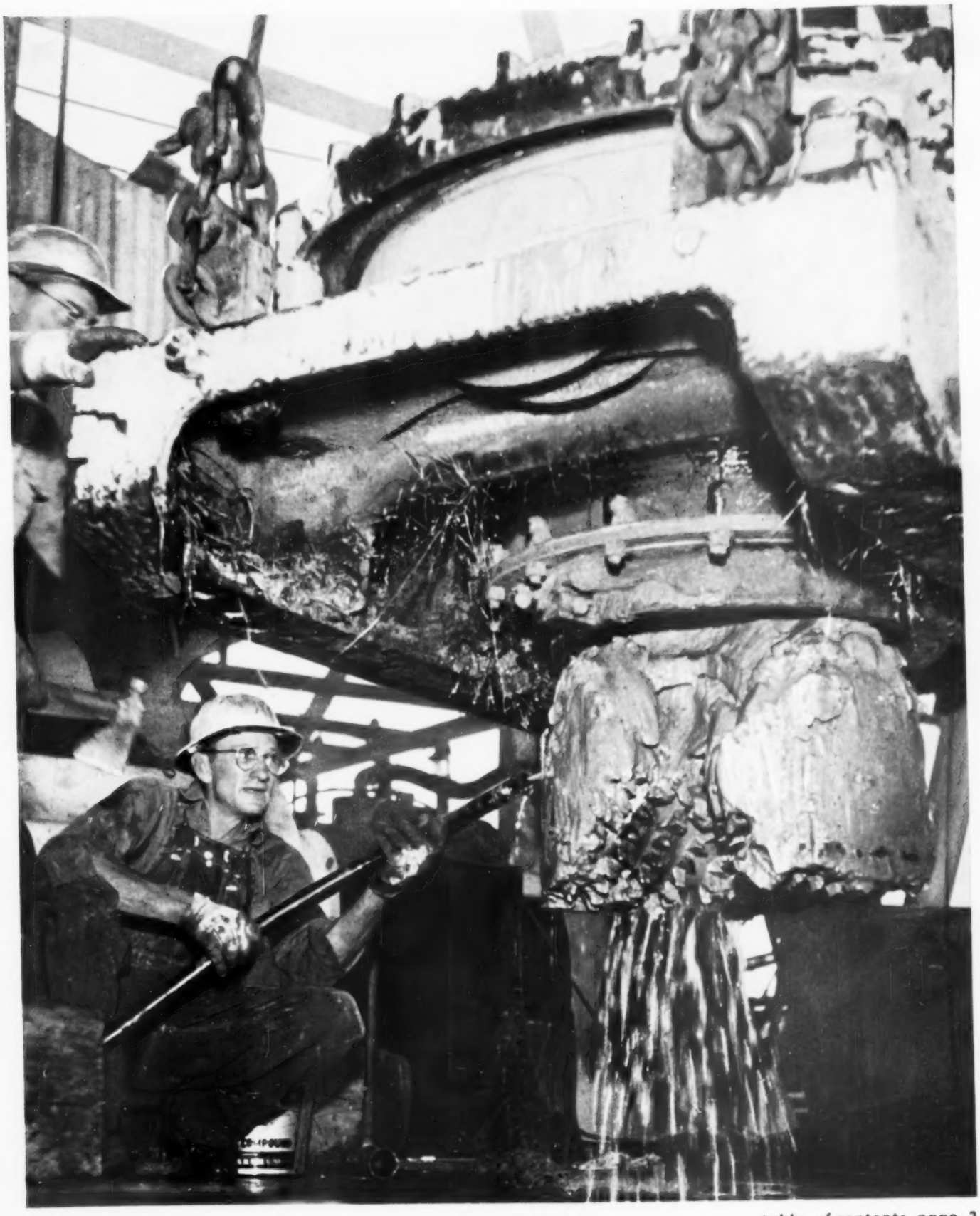
WORLD PETROLEUM

AUGUST 1959



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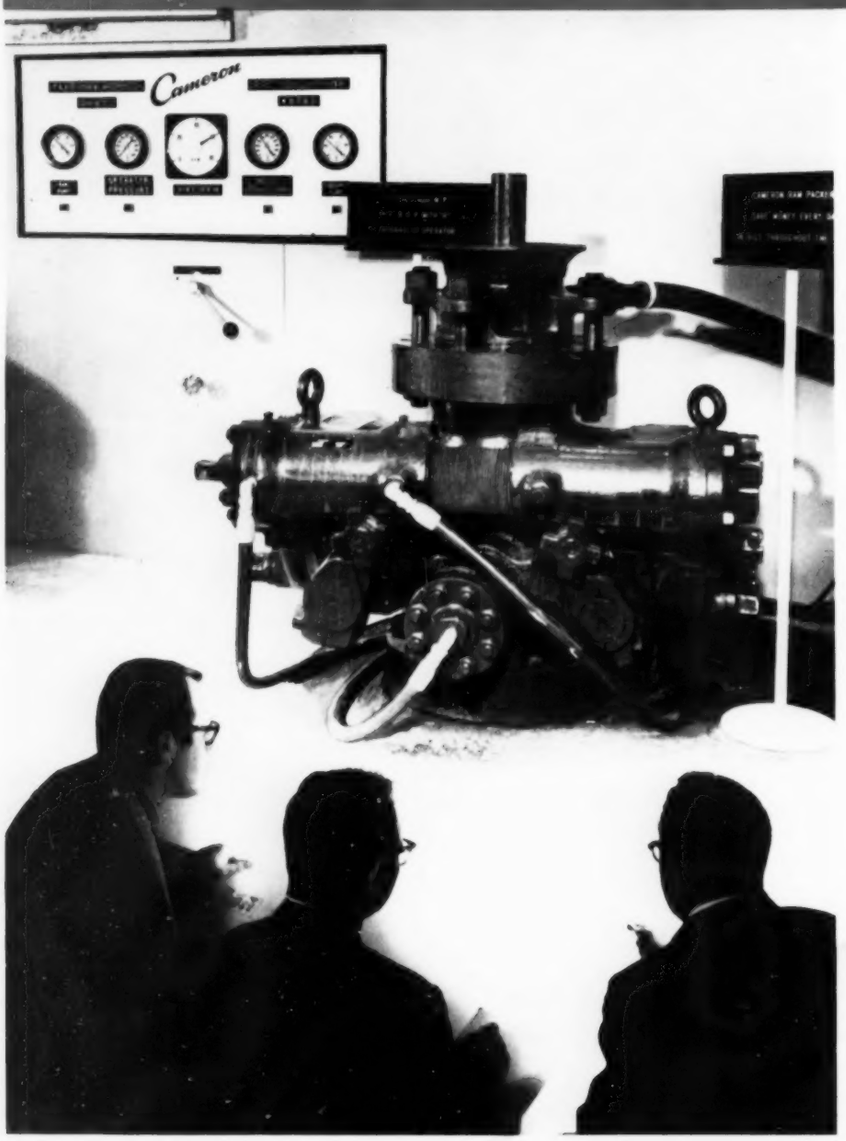

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Petroleum
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JANUARY 1959
Look Like Record?
To the Editor:
We, the employes of the Yorktown, Virginia, four-drum coking unit, are seeking information about refinery record runs to see if we have not in fact set a new record run for a Delayed Coker.
We employes of American Oil Company were assigned to a new four-drum coker built by the Lummus Co., in 1956, and put on stream in January, 1957. We are now in run No. 4, and as of today, have been on stream 240 days without even a partial shutdown. During this run we have averaged approximately 17,000 b/d through the furnace which is somewhat more than design, and to us means that we have not babied the unit for a long run.
The employes of this unit read your magazine and enjoy it very much and would appreciate it very much to see us recognized in your magazine for this accomplishment.
We would appreciate it very much if you will notify us as soon as possible whether we have or have not established this record and, if not, just what the record is.
Howard D. Rogers,
Operator
Yorktown, Va.

* to date
(March 25, 1959)
their record now stands at 354 days..

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Outsize bit used in early stages of an offshore well 15 miles out in the Gulf of Mexico. Color plates are reproduced through the courtesy of William H. Walsh, editor of *Service*, house magazine of Cities Service Company.

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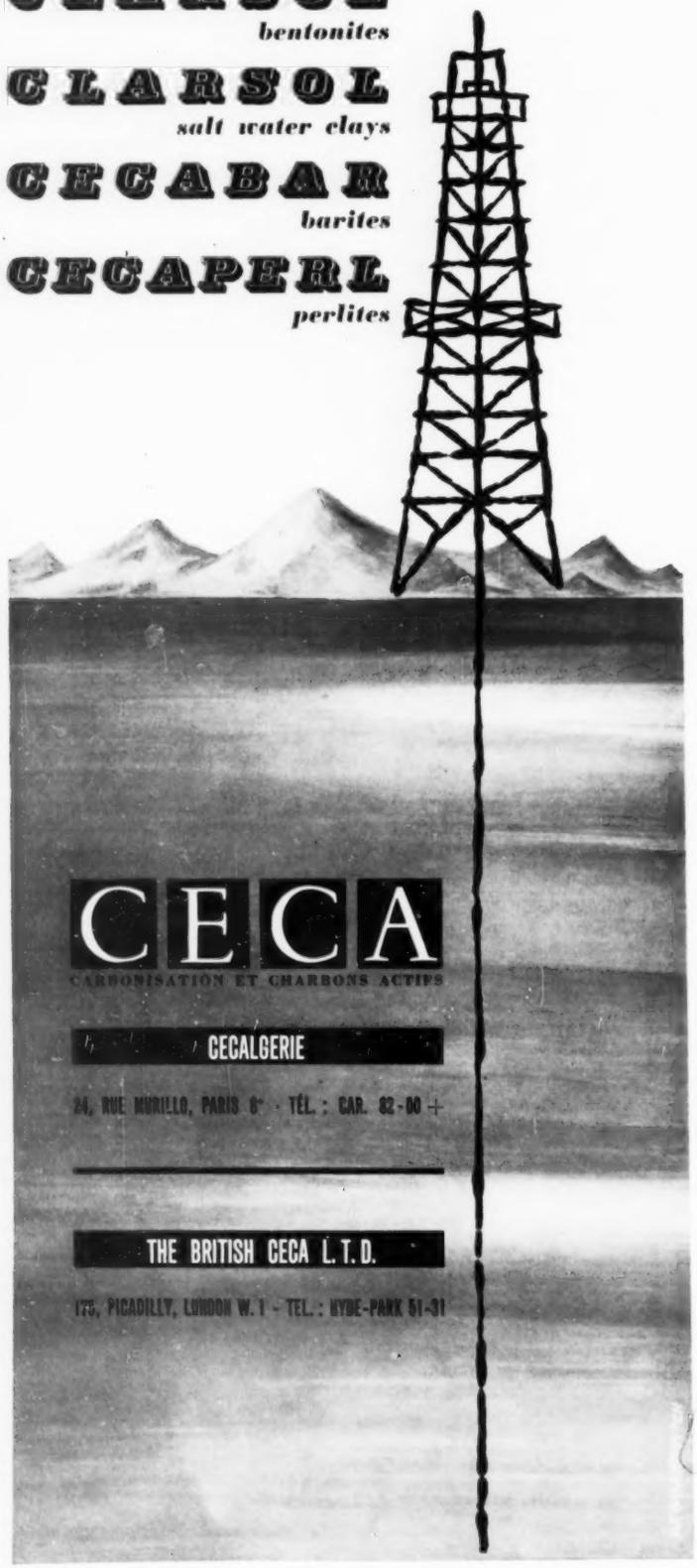
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Washington

By Joseph B. Huttlinger

Depletion Attacks Continue

Although the oil industry was cheered by the recent vote in the U.S. Senate on the income tax depletion allowance for crude oil and natural gas production, thoughtful minds in the industry are concerned about the rising and constant attacks on depletion.

In particular, heads of companies with foreign oil operations, as well as heads of foreign governments, are watching the widespread attacks on depletion for oil operations outside the U.S. These attacks, largely from friends of depletion for domestic operations, have been unanswered on the Senate floor.

So, industry economists are preparing their arguments in defense of the allowance for next November when the House Ways and Means committee plans to look into oil's depletion in its searching study of methods of "constructive tax reform."

In lining up their case, industry economists will do well to address themselves to one basic assertion of foes of depletion. This is that oil and gas production pays too little of its earnings in income taxes. That is the most damaging point made by foes of depletion. If it can be answered adequately, the attack on depletion will crumble. Measured by other standards, such as rate of return on investment and prices to consumers, oil production and refining seems to be in line with the record of other industries.

The November hearings are important for oil and represent the first close study of depletion by a tax committee in a number of years. They come at a time when foes of depletion have whipped up public feeling and represent the first hearings into depletion at a time when the public is familiar, if only in a general way, with the depletion allowance.

While the less said the better might have been a wise policy 10 or 20 years ago, this is no longer true. Depletion attacks have been slapped on the front pages of newspapers so long and so often, that the full and clear cut facts to justify the tax provision also must be put forth. The battle, in part, is for public understanding of the depletion.

Oil men are encouraged by what happened in the Senate in June from several standpoints, as follows: First, the total of those voting or recorded for a slash in depletion was only 29, compared with 34 in a similar vote a year ago. A vote of 50 is needed for a change. Second, the 18 freshmen members of the Senate, who had been expected to show a majority for shaving down the depletion, actually lined up two to one against a change. Three of the newcomers did not vote, but five were recorded for a slash and 10 against it. Third, several Senators who voted for a slash in depletion a year ago, changed over in the vote on June 25.

To put these cheering facts into balance, it must be remembered that the depletion amendment of Sen. Paul Douglas, D.,

Pipeline

Ill., was offered to a near-deadline income tax measure. Many Senators feared to load it down with controversial amendments, such as depletion, lest it put the entire tax measure in jeopardy. This is widely regarded as the reason Senators Albert Gore, D., Tenn., and Mike Mansfield, D., Mont., this time voted against a slash, a change from their positions a year ago.

Sen. George D. Aiken, R., Vt., a foe of depletion, hinted that 35 to 40 members of the Senate may be ready to vote for a slash in depletion. He told the Senate: "We shall come nearer to plugging the tax loopholes than we have been up to this time, but not if we force a vote only two days before the fiscal year expires."

The Douglas amendment would have provided for a cut in the depletion allowance for oil operations both in the U.S. and over the world on income taxes due to the U.S. Douglas proposed the present rate of 27.5% be left at 27.5% for operators with gross incomes of less than $1 million; to 21% for gross incomes of $1 million to $5 million; and to 15% for gross incomes of more than $5 million.

International Depletion

Senators Russell Long, D., La., and A. S. Mike Monroney, D., Okla., leaders in the battle against the Douglas amendment, called for different treatment for revenues from oil operations outside the U.S.

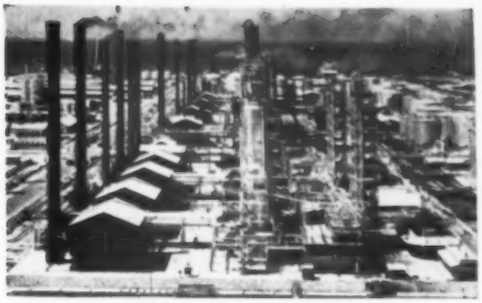
Otherwise, said Long, we continue an "injustice to U.S. oil operators." He said "we could be deriving perhaps $500 million a year income, yet we are deriving about $1 million a year" by operation of the actual credit against income taxes for "anything" paid to the foreign government.

Monroney said he has "encouraged legislation to try to correct the tax regulation which, in effect, gives 55% depletion to producers of oil in the Arabian countries. This is an outright discrimination against our domestic producers." Monroney objected to the "vast tax advantages" given to overseas oil operations and the "slick trick" of allowing payments to foreign governments as a direct credit against taxes due the U.S.

The firing at tax rates on companies operating abroad makes it impossible for Congress to enact early legislation, as offered by Rep. Hale Boggs, D., La., to give more, not less, tax incentives to foreign operations. House Ways and Means committee opened hearings in July on the Boggs bill to give new incentives by several measures, including these: 1. Creation of a new class of foreign business corporations which would pay U.S. income taxes only when foreign earnings are brought to the U.S. 2. Extend Western Hemisphere trade corporation tax rates of 38% to business activities conducted anywhere outside the U.S. Except for Western Hemisphere operations, the tax rates are 52%. 3. Set up an alternate limit on credit allowed for foreign taxes on the basis of total foreign taxes against total foreign income. 4. Allow credit for tax sparing by foreign countries upon certification by the Secretary of State.

Import Quotas Higher

Oil import quotas for the last half of this year reflect both



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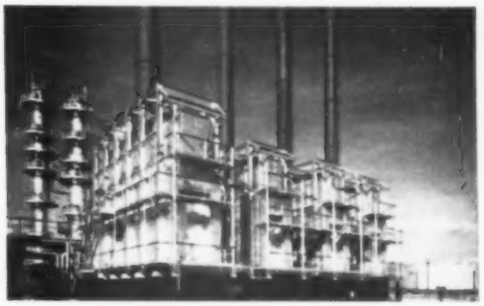

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rising demand for oil on the West Coast and more imports from Canada, with the exemption of Canadian oil from the imports program effective June 1.

They reflect a slight drop in domestic demand in districts one through four, where crude and unfinished oil imports will be cut three per cent. U.S. officials are worried about oversupply in the area.

The new quotas show a determination to avoid any shortages. Thus, residual oil to the Gulf and East Coast is boosted about six percent to build up stocks.

The new quota figures disclose at least two sleepers in the program.

For one thing, they show that imports of crude and unfinished oils to districts one through four were let in during the first quota period at about 16,600 b/d more than allowed by the rules of the program. This came by a mistake, it is explained.

For a second, they show that U.S. refineries on the northern border with Canada, now are eligible for two allocations to import, once from Canada, and once from other sources. In the first quota period, a refiner importing from Canada was not eligible to get a quota to import from elsewhere.

The excess quotas in the first period came about in this way. The rules of the program call for imports of crude and unfinished oils and of finished products except residual oil to be held to nine percent of total estimated demand in districts one through four. This demand was estimated at 8,412,000 b/d, and nine percent of this is 757,080.

Within this total, finished products other than residual may come in up to levels they held in 1957, and crude and unfinished oils get what is left.

Oil companies making reports to Oil Import Administration reported their finished products at 60,000 b/d, so OIA began allocating the rest, about 697,000 b/d, in crude and unfinished quotas.

Then, it turned out the product imports were reported at 16,600 b/d too low, as some companies did not include number four fuel oil. They considered this as residual oil. By this time, it was too late to call back or revise the crude quotas, so OIA let them ride.

If the companies had reported their number four as finished products, as called for by the regulations, it would have meant this much less in crude oil.

Residual oil quotas, however, did not reflect the number four oil, as this was deducted before figuring quotas for residual, OIA said.

The eligibility of northern tier refiners to import crude oil from other areas than Canada, as well as from Canada, makes that many more companies to nibble a bit off the import quotas. They can take all the Canadian crude they can use, plus other crude imports up to their ability to exchange it for domestic crude and to run the domestic crude. In addition, they are limited to the same percentage of inputs as imports as are other refiners.

OIA officials are considering changes in the program to limit the crude imports allowed these refiners in the allocation period starting next January. One thought is to make them deduct from refinery inputs, the base for obtaining a quota, the amount of Canadian crude they have run.

U.S. officials foresee imports of crude oil and of oil products rising by 75,845 b/d in the last half of this year into the U.S. and Puerto Rico.

This is one way of measuring the impact of the new import quotas. This overall figure does not jibe with government figures, which are for only part of the imports, or from analyses from others, which may include other things.

U.S. officials admitted, however, it is fair to say that the new quotas are likely to see imports of 1,559,898 b/d in the last half of this year, compared with 1,484,053 in the first quota period, March through June.

(*Continued on page 14*)

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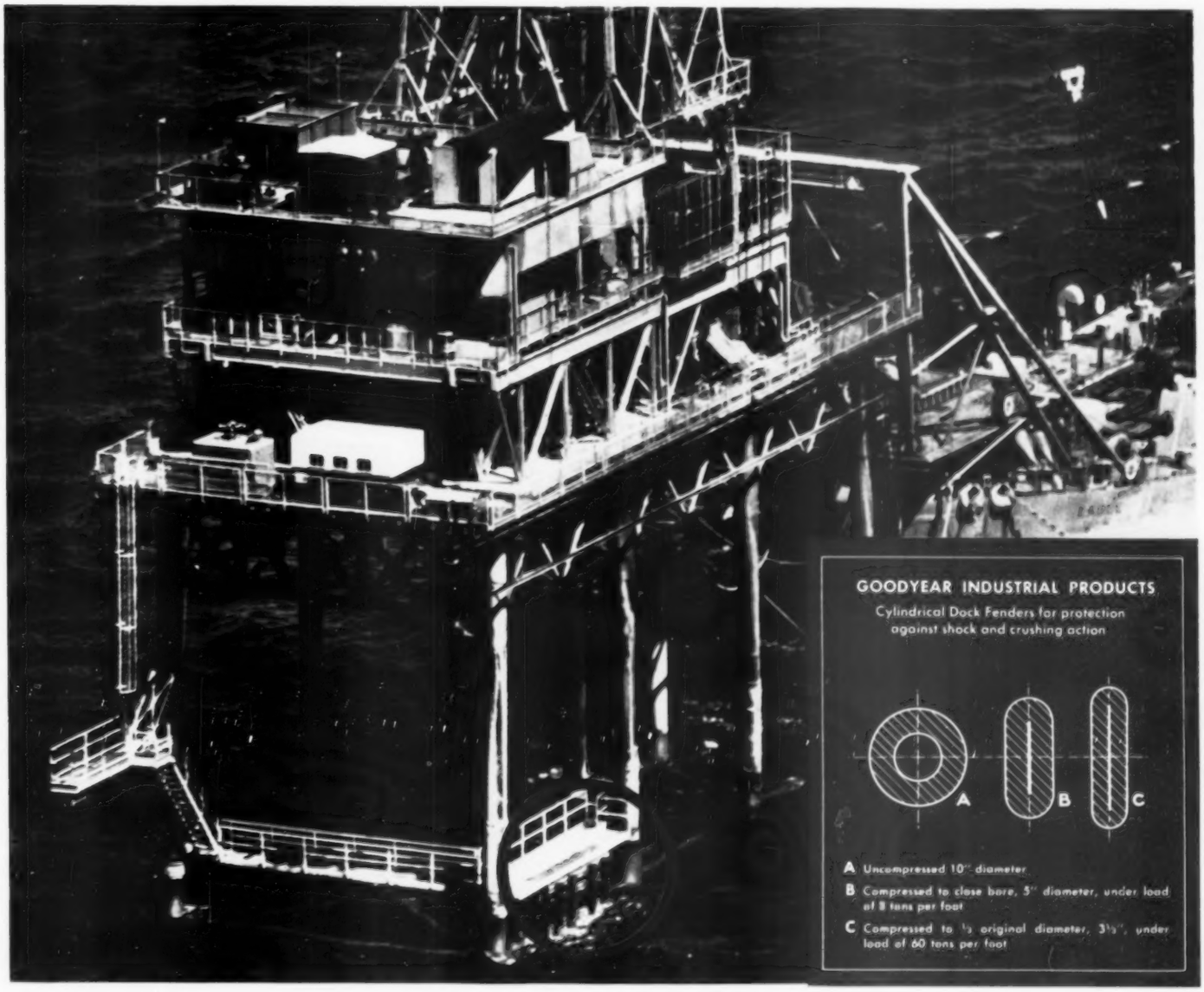
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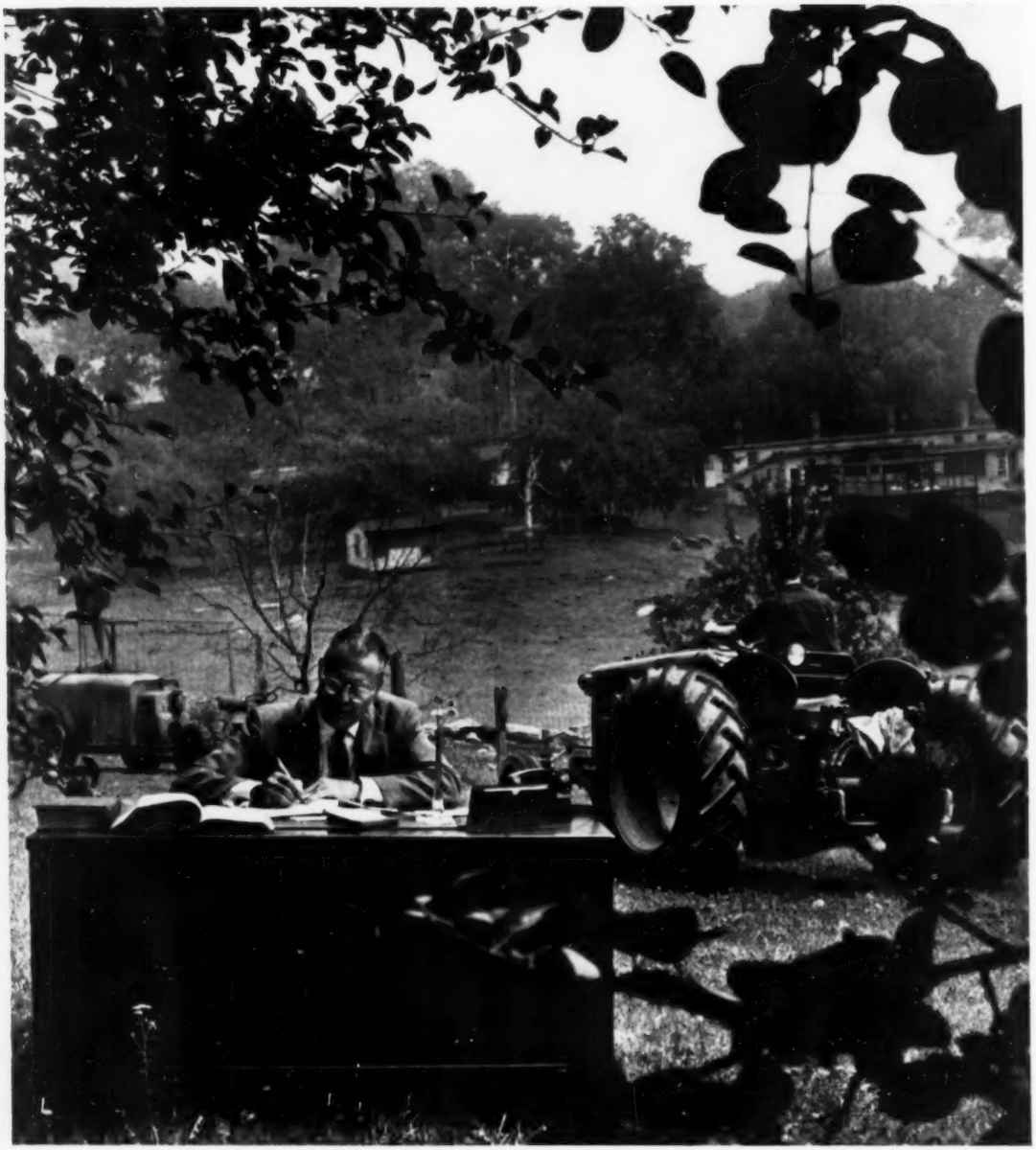

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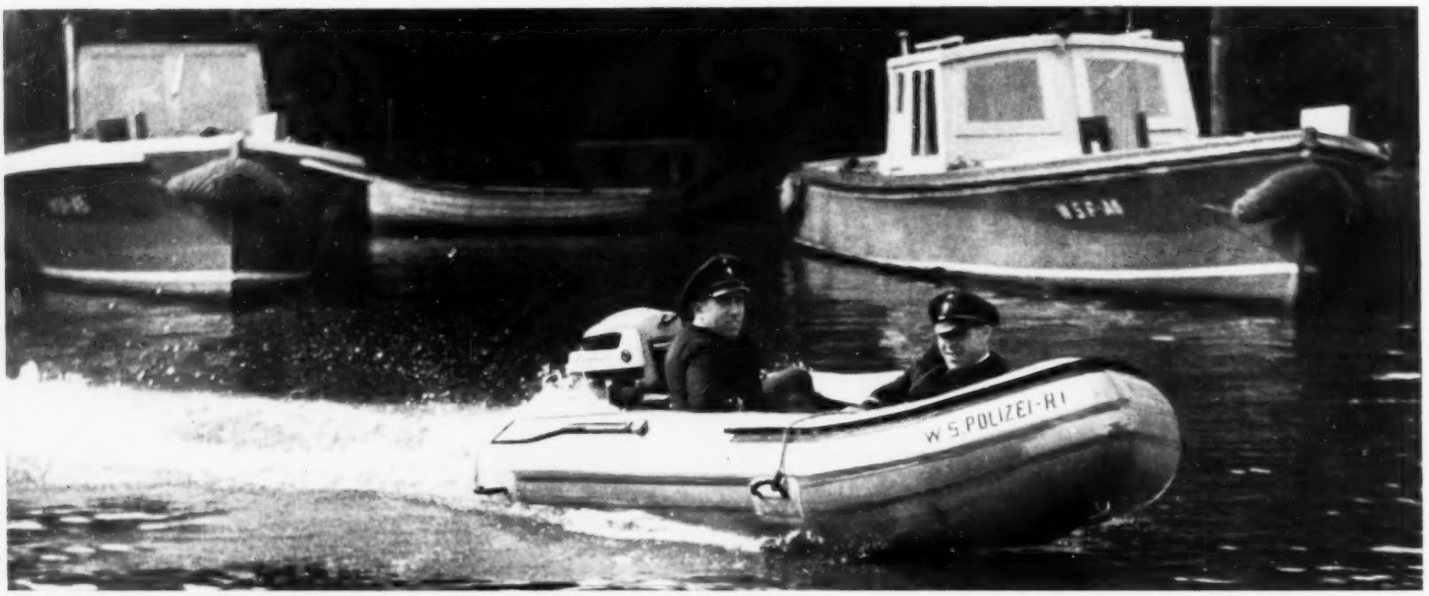

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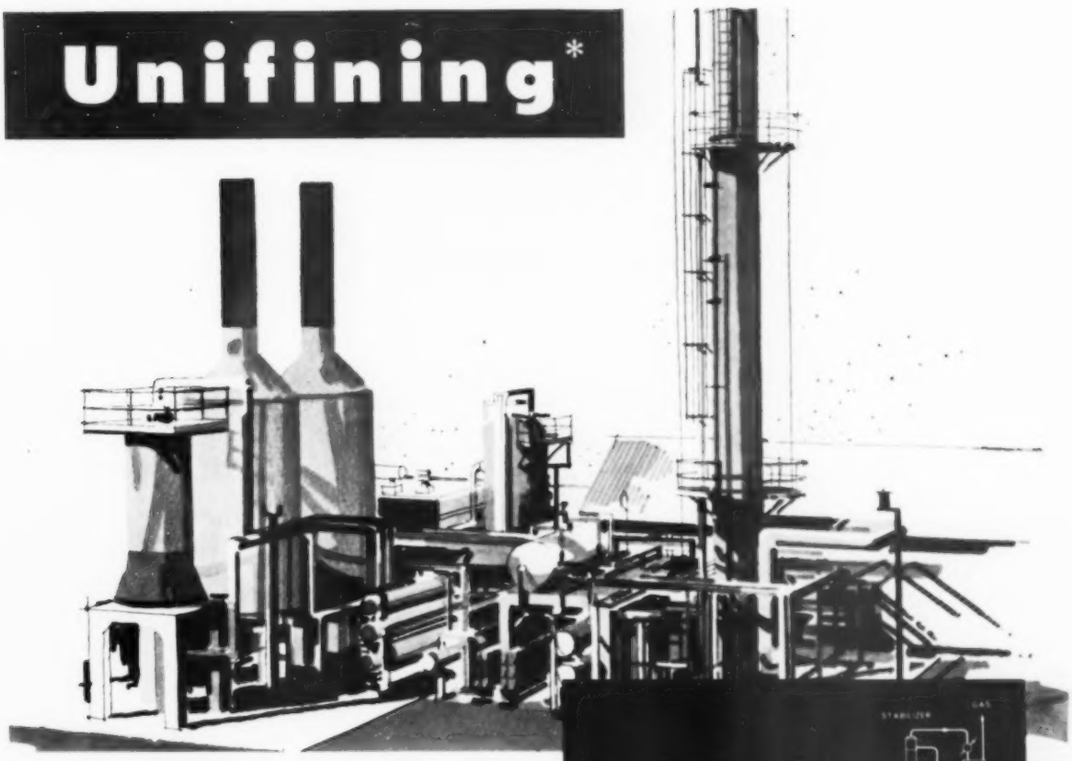

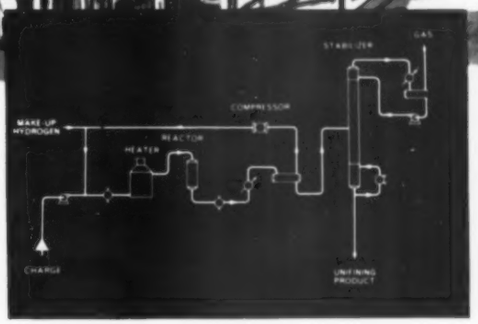

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Westinghouse Appointment

H. S. Purnell has been appointed manager of the generator and transportation department, apparatus products division of Westinghouse Electric International Co. He formerly was assistant director for Middle East area sales in New York. Mr. Purnell replaces R. L. Ackerman who has been named regional supervisor stationed in Geneva, Switzerland.

Larger Packaged Field Compressor

A new addition to its line of packaged compressors for gas and oil field applications has been announced by Clark Bros. Co. The Model CFB features a 5" stroke, two-cylinder, balanced/opposed compressor built in sizes ranging from 200 to 350 bhp. The case and running gear are extra heavy throughout to accommodate up to double the horsepower of a Clark CFA-2.

New Dresser Director

J. B. O'Connor, president of Dresser Industries Inc., has announced appointment of James R. Brown, Jr., as director of manufacturing. Mr. Brown has been with Dresser since 1941, having successively been coordinator of industrial engineering, general superintendent for transportation products, manager of foundries, and works manager.

J. R. Brown

N. Andrew

Johnston Testers Promotion

Norman Andrew has been appointed manager-operations of Johnston Testers Inc. In his new capacity, he will be responsible for all Johnston oilfield service activities. Until his recent appointment Mr. Andrew was manager of manufacturing for Johnston Testers.

Cuba's 1958 Production

Cuba's production of crude oil last year was 340,097 bbl (932 b/d), and of natural naphtha 3,435 bbl. Total footage drilled last year was 134,036, it is reported, with Cuban Stanolind Oil Co. accounting for 36.4% of this.

Esso Jamaica Refinery

Esso Standard Oil SA has come to an agreement with Jamaica officials to set up a $20 million 26,000 b/d oil refinery, it is reported from Kingston.

Esso is to provide products at no increase from present retail prices to the consumer; there is to be no loss of revenue to Jamaica; and the prices are not to exceed prices of imported products. Esso is not to have monopoly rights. Some 1,000 are to be employed as a result of the plant, 200 of them refinery personnel. The deal apparently kills plans of Frank St. Hilaire, Trinidad-born industrialist, to negotiate with the government for a refinery.

Cuban Penalty Paid

Cuban Stanolind Oil Co. made a penalty payment of $1,000,000 to withdraw from an agreement with the Cuban-Venezuelan Oil Voting Trust and Trans-Cuba Oil Co. The trust told stockholders that Cuban Stanolind withdrew late last year from the agreement of 1955 under which it committed itself to spend $14,475,000 through July 1963 to acquire a 50% working interest in concession rights covering 14 million acres. Stanolind reportedly spent $5,500,000 for exploration work and drilling from 1955 until the end of last year.

Schlumberger Well Surveying Corp. has received an "Award of Merit" for its 1958 advertising campaign from Associated Business Publications. W. J. Gillingham (center), Schlumberger president, and R. R. Rieke, sales manager (right), were individuals receiving credit in the award. Earl Rives presents award on behalf of ABP.

Portable Building

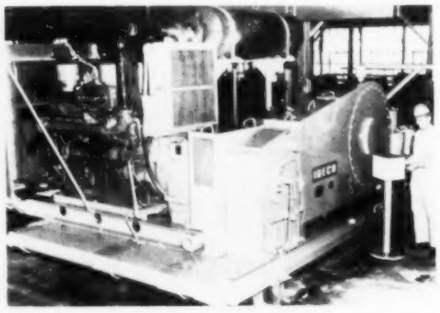
A mobile and collapsible building that can be erected and ready for occupancy in 20 minutes, yet featuring extreme ruggedness, has been designed by Porta-Kamp Co., Inc., Houston, Texas. Several units can be joined together to provide mess halls, offices, dormitories, and other uses. The S-816 is a knockdown building that collapses into a very compact package. Units are steel skid-mounted to take the abuse of any kind of weather or field use.

New Atlas-Jet Perforator

The new "Atlas-Jet"—reported to be an exceptionally effective shaped charge recently developed for conventional steel case retrieveable 4" and 5" jet gun—has been announced by Perforating Guns Atlas Corp. In simulated subsurface tests at 1,500 psi fluid pressure, and under a temperature of 180 F, Atlas-Jet charges were fired into standard targets, each comprised of a 15"-deep Berea sandstone core mounted in 4½" drill pipe with a ⅜"-thick steel face-plate backed up by ¾" hydromite. In tests with ½" clearance between the gun and the target, the new charge obtained a well index of 1.6, with an entrance-hole diameter of 0.6" and a clean-hole depth of approximately 10". The company stated that corresponding results were obtained in surface tests with the same ½" clearance between the gun and target. The Atlas-Jet should be of particular value for wells in which deep penetration and exceptionally large and clean hole size are of major importance for greater well production, as well as for injection or treatment jobs, according to the company.

Dowell Appoints Harmon

J. A. Harmon has been appointed the new manager of technical services and development for Dowell Division of the Dow Chemical Co. He will fill the vacancy in Tulsa left by Joe Stewart, who will become district manager for Dowell in New Orleans.



First Hercules-built Hall-Scott power unit incorporated in an especially designed Ideco (one of the Dresser Industries) independent pump drive unit, ready for shipment to Venezuela for Mene Grande Oil Co.: Operating on gasoline, natural gas, or LPGas, the low weight-to-horsepower ratio makes the unit suited for oil-field applications because it can be conveniently truck-mounted.

Texaco Caribbean Marketing

Texaco plans to dissolve its marketing partnership with Shell and to set up a separate organization for sales in Trinidad and the Caribbean. Now, Texaco markets through the Shell and Regent Distributors of Trinidad Ltd., and the Shell and Regent Petroleum Distributors of West Indies Ltd.

The combined marketing companies are a heritage of the Regent Oil Co. operations which Texaco bought in 1957. Since then, Texaco has opened a number of gasoline stations under its own name. When the split is completed, Texaco, Shell and Esso will be competing in the area. The Trinidad market amounts to 5,000 b/d but ships bunkers account for another 35,000 b/d.

Brazil-Bolivia Oil Deal

The Brazilian Foreign Office (Itamariti) has forwarded to the Brazilian Ambassador in La Paz a communication from the Petroleum Council to the effect that Companhia Petrolifera Brasileira, Petroleo da Bolivia S.A. (Petrobol) and Uniao Brasil Bolivia S.A. have complied with all legal formalities required to qualify vis-a-vis of the Bolivian government to exploit petroleum in Area B of Reversible Notes 6 CR of March 29, 1958. Petroleo Brasil Bolivia S.A. has desisted from the undertaking and Petroleo Andino S.A. (Petrolansa) may qualify once the measures necessary for its registration with the National Department of Industry and Commerce have been complied with.

The Petroleum Council notified Petroleo Brasil Bolivia S.A. as follows: Deposit a sum corresponding to 20% of the capital; supply the Petroleum Council with a list of subscribers together with the number and category of shares taken up by each. Add the following to Article 5 of the company's statutes: An absolute majority of the shares entitling to vote must belong to Brazilian physical persons or to juridical persons in accordance with Brazilian law; the company shall maintain its headquarters in Brazil until the Bolivian concessions expire; the company must comply with these demands within 15 days and failure to do so will be taken as tacit desistance from participating in the exploitation.

Brabol has ignored the notification. In view of the Brazilian Government's decision, altering the conditions for obtaining financial resources, Deltec S.A.—Investments, credit and Financing, notified Brabol that it would be unable to assist financially in its organization.

Opens New York Office

Western Geophysical Co. of America has opened branch offices at 375 Park Ave., New York, under the management of Bill J. Ramey to maintain closer liaison with oil company overseas exploration departments headquartered in New York City.

Panama Test Dry

Champlin Oil & Refining Co.'s No. 1-8 Anita Bay well was drilled and abandoned at total depth of 9,537 ft. Only one slight oil show was encountered in a fossiliferous lime section from 7,410 ft to 7,510 ft. No drill-stem tests were made. The test was bottomed in beds of Oligocene or older. Test was drilled in Chiriqui Lagoon: lat. 9° 0′ 58″ N; long. 81° 54′ 30″ W. Operator has now moved approximately 35 miles westward, and is drilling the No. 1 Almirente, located lat. 9° 16′ 58″ N; long. 82° 21′ 23″ W, recently drilling at 2,705 ft. Southland Royalty Co. and Kerr-McGee Oil Industries Inc. each owns one-fourth interest in this operation.

Tanker Construction Up

Oil tankers under construction in the world amount to 329 ships of 5,226,548 tons gross (159 steamships of 3,755,375 tons and 170 motorships of 1,471,173 tons), which is 270,622 tons less than the previous quarter, and represents 52.3% of the total tonnage under construction in the world.

Countries for which this oil tanker tonnage is being built show 1,365,033 tons for registration in Great Britain and Northern Ireland; 667,245 tons for Liberia; 476,895 tons for Norway; 476,078 tons for USA; 297,400 tons for Panama; 260,222 tons for France; 250,098 tons for Italy; 229,676 tons for the Netherlands; and 211,415 tons for Japan. (Source: *Lloyd's Register*).

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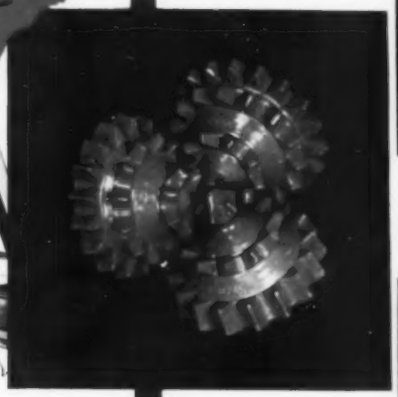


M4N

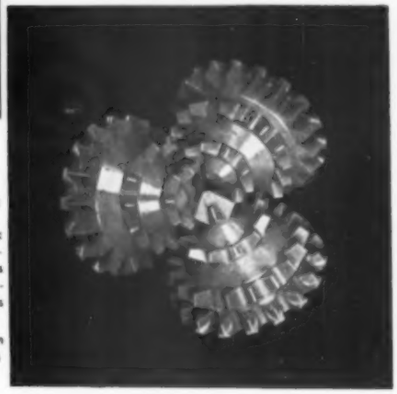
FORMATION RATINGS: For shale, lime, sand, shaley lime, and other medium to medium hard formations.

SIZES: 23 bit sizes from 5⅞ inches to 12¼ inches

M4

FORMATION RATINGS: For hard lime, hard shale, hard sands, anhydrite, dolomite, and other medium hard to hard formations.

Sizes: 23 bit sizes from 5⅞ inches to 12¼ inches



M4L

FORMATION RATINGS: For medium hard-abrasive to hard formations where hard lime, dolomite, and chert streaks predominate.

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CANADIAN NOTES

NWT Farmout

Canada Southern Petroleum Lt. has concluded an agreement with Home Oil Co. Ltd., Signal Oil & Gas Co., Kern County Land Co., Alminex Ltd. and United Oils Ltd. providing for the latter companies to pay $3,500,000 and conduct a 5-well exploratory program in exchange for 50% exploration rights on 1,224,050 acres in the Northwest Territories. The properties currently are held under petroleum permits by Canada Southern and its partners. Magellan Petroleum Corp. and Oil Investments, Inc.

McKinnon May Head Energy Board

I. N. McKinnon, chairman of the oil and gas conservation board of Alberta, has the inside track to be named chairman of the new National Energy Board being created by Act of the Canadian Parliament. Action completing creation of the board, with powers over oil and gas pipelines, including their tariffs and tolls and permission to construct them and their routes, was expected to be completed during June.

The board also would have authority over export and import of gas, but not of oil. However, the act may be extended to cover imports and exports of oil by an order in council of the federal cabinet. The energy board would have no authority over regulation of oil and gas prices in the field.

The creation of the board may bring a delay in Canadian approval for pending applications to export natural gas to the U. S., it is felt. Premier E. C. Manning of Alberta said this will mean a delay of "at least four to six months" while the new board gets into operation, makes its studies and recommendations.

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New Sulfur Plant

A sulfur extraction plant capable of handling 30 million cubic feet of raw gas per day has started production in the Okotoks gas field of Alberta under a sulfur-gas project jointly undertaken by Devon-Palmer Oils Ltd., and Texas Gulf Sulphur Co.. Inc.

Field production facilities and a gas gathering system to serve the Okotoks sulfur plant, about 25 miles southeast of Calgary, comprise part of the $9,500,000 project. When on full stream, the yield will be about 12,500,000 cubic ft of residue gas and 370 long tons of sulfur daily.

The residue gas will be delivered into the system of Canadian Western Natural Gas Co.. Ltd.. a major utility in Alberta, for use in the Calgary area. It is planned to build up a large supply of sulfur as a forerunner to marketing arrangements for the sulfur.

The Okotoks field was discovered by Shell Oil Co. of Canada Ltd., in 1951. Under terms of a farmout arrangement with Shell, Devon-Palmer and Texas Gulf each will receive initially at least 42½% of the plant's production. Texas Gulf is plant operator. Devon-Palmer operates the gas wells and gathering system.

Tanner New CGA Head

N. E. Tanner. director, Trans-Canada Pipe Lines, Ltd., Calgary, was elected president of the Canadian Gas association at the annual meeting held in Victoria, B. C. R. C. McPherson, senior vice president, Canadian Western Natural Gas Co., Calgary, and O. L. Jones, vice president and general manager, Consumers' Gas Co., Toronto, were elected first and second vice presidents.

Equality For Canadian Oil

In the North American oil economy, Canada wants to be treated as an equal. not as a "country cousin," according to W. Harold Rae, president of Canadian Oil Companies Ltd. He urged large American oil companies with substantial Canadian oil reserves to develop "logical US markets." If they don't, he warned, "Canada will have no alternative but to face the situation and take what steps are considered necessary to her own best interests to solve her oil marketing problem. "This will unquestionably involve the installation of a major cross-country pipeline system and artificial barriers against foreign oil."

Mr. Rae called the recent exemption of Canadian crude from the mandatory USA import control a step in the right direction.

Canada's Gas Reserves Questioned

The Federal Power Commission (FPC) is threatening to refuse to accept for filing applications of Midwestern Gas Transmission Co. and Michigan-Wisconsin Pipe Line Co. to bring Canadian natural gas to the U.S. midwest because the applications are not backed up with details of gas reserves available to the gas supplier, Trans-Canada Pipe Lines Ltd.

Trans-Canada has told the FPC that it faced delay in furnishing the data sought, due to pending legislation to set up a Canadian National Energy Board and due to the fact it is adding to its reserves. Trans-Canada said it wanted to prepare a single presentation that would meet the needs of the upcoming energy board and of the FPC.

Also, Trans-Canada said that "in recent months, it has been successful in placing under contract large quantities of additional gas reserves and negotiations are currently being carried on for further and equally large quantities."

Faced with failure of the gas reserves data to be forthcoming, Midwestern has asked the FPC to use by reference the gas supply and delivery data available in G-2306, the first case involving natural gas from Canada to the U. S. Midwest. FPC denied all application in the earlier case. The FPC is studying what to do about that request. Meanwhile, speculation continues as to why Trans-Canada is failing to come forward with the needed data.

HOWARD M. GUSTAFSON has been appointed superintendent of marketing, Canadian operations, in Phillips Petroleum Co's international department, headquartered in Calgary, Alberta. He succeeds J. P. Coates who is transferring to the company's United States operations.

D. G. WELDON has been appointed assistant general manager of Interprovincial Pipe Line Co., with headquarters in Edmonton. Mr. Walton succeeds F. J. Stubbs who is moving to the company's Toronto office as assistant to the president. Prior to coming with Interprovincial in 1950, Mr. Weldon served almost 15 years with Andian National Pipe Line Co. in Colombia.

Mission Representative Appointed

Keith C. Snyder has been appointed Canadian Representative for the Mission Manufacturing Co. Mr. Snyder was associated with Jones & Laughlin Supply Division for six years and with Drexel Canadian Equipment, Ltd. for two years before joining Mission. His headquarters are in Edmonton, Alberta.

$20 Million From Alberta Sales

Alberta received $20,274,350 for 66 parcels of oil and natural-gas rights, leases, and reservations scattered throughout the province in a recent sale. Latest sale brings to more than 880 million the amount the provincial government has taken from oil and gas revenues since the Leduc field was discovered in 1957. So for this year, land sales in Alberta have brougt in more than $25 million, with the latest sale the biggest in some time, although short of the record $33 million realized at a single sale in 1954.

W. W. Luthy has been appointed manager of the producing department of Canadian Oil Companies Ltd. He was formerly development manager of the company's producing department at Calgary, Alberta. Mr. Luthy has been with Canadian Oil Companies, Ltd. since 1955 and previously was manager of crude ail supply for Ashland Oil & Refining Co.

F. J. STUBBS has been appointed by Interprovincial Pipe Line Co., Edmonton, to assistant to the president. He will be located in Toronto.

JOHN S. HEGWER has joined Mobil Oil of Canada, Ltd., Calgary, as a senior petroleum engineer coordinating development drilling.

Washington Pipeline

(Continued from page 6)

The totals include 1,450,362 b/d of imports under quotas and another 109,536 b/d from Canada without a license. This is a gain of 20,000 b/d from Canada.

For those who like figures, here are some others:

Virtually the entire increase is to district five, which is west of the Rocky Mountains, where the first quota imports were 211,100 b/d. The last imports, on a comparable basis, are to be 265,544 b/d —the difference between estimated domestic supply and demand.

All but about 10,000 b/d of this, which will be residual oil and other finished products, will be crude and unfinished oils.

The district five figure include 22,005 b/d of crude and unfinished oils that have been coming in from Canada. For the last half of this year, this is expected to increase by another 20,000 b/d with the exemption of Canadian oil to a total of 285,544 b/d.

In districts one through four, the total of crude and unfinished oils allowed in is set at 681,820 b/d, down 19,644 b/d from the levels of the first quota period. Another 67,531 b/d from Canada is expected to come in without license—the same as in the first quota period.

Finished products other than residual oil to districts one through four are allowed in at 76,631 b/d, up 433 b/d from the first period.

Residual oil imports, meanwhile, are allowed in at 364,995 b/d, up 21,658 b/d from the first period. U.S. officials said that demand for residual is estimated at 330,000 b/d, but that stocks should be increased at the rate of 35,000 b/d to make sure of enough in event of a cold winter.

Overall figures include imports into Puerto Rico of 83,377 b/d, down 1,128 b/d from the first quota period levels. Bulk of the island's imports are in crude oil.

The figures do not take account of ships' bunkers nor of military imports for reexport which together account for about 140,000 b/d.

These figures do put into focus, however, the various reports that have come from the OTA in Washington, and have been confusing.

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Undoubtedly, NEWTHERM is one of the easiest of materials to apply. It is supplied in plastic form and in a wide range of standard-sized sections and slabs, smoothly finished and straight edged for immediate fitting. The finished job is very neat, with minimum joints, and appliers particularly appreciate the handleability of the material especially in difficult situations.

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For generations it took the men of his family weeks of back-breaking labor with a stick plow and bullock to plow their land. With a modern tractor, this boy will do the same job in a day.

Everywhere machines are easing the burdens of men; increasing their productivity. To keep the tractors, the bulldozers and the industrial machines running smoothly requires a steady supply of quality petroleum products—gasoline to power them, special oils and greases to protect and to preserve vital engine parts.

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STANDARD-VACUUM OIL COMPANY **POWERS PROGRESS**

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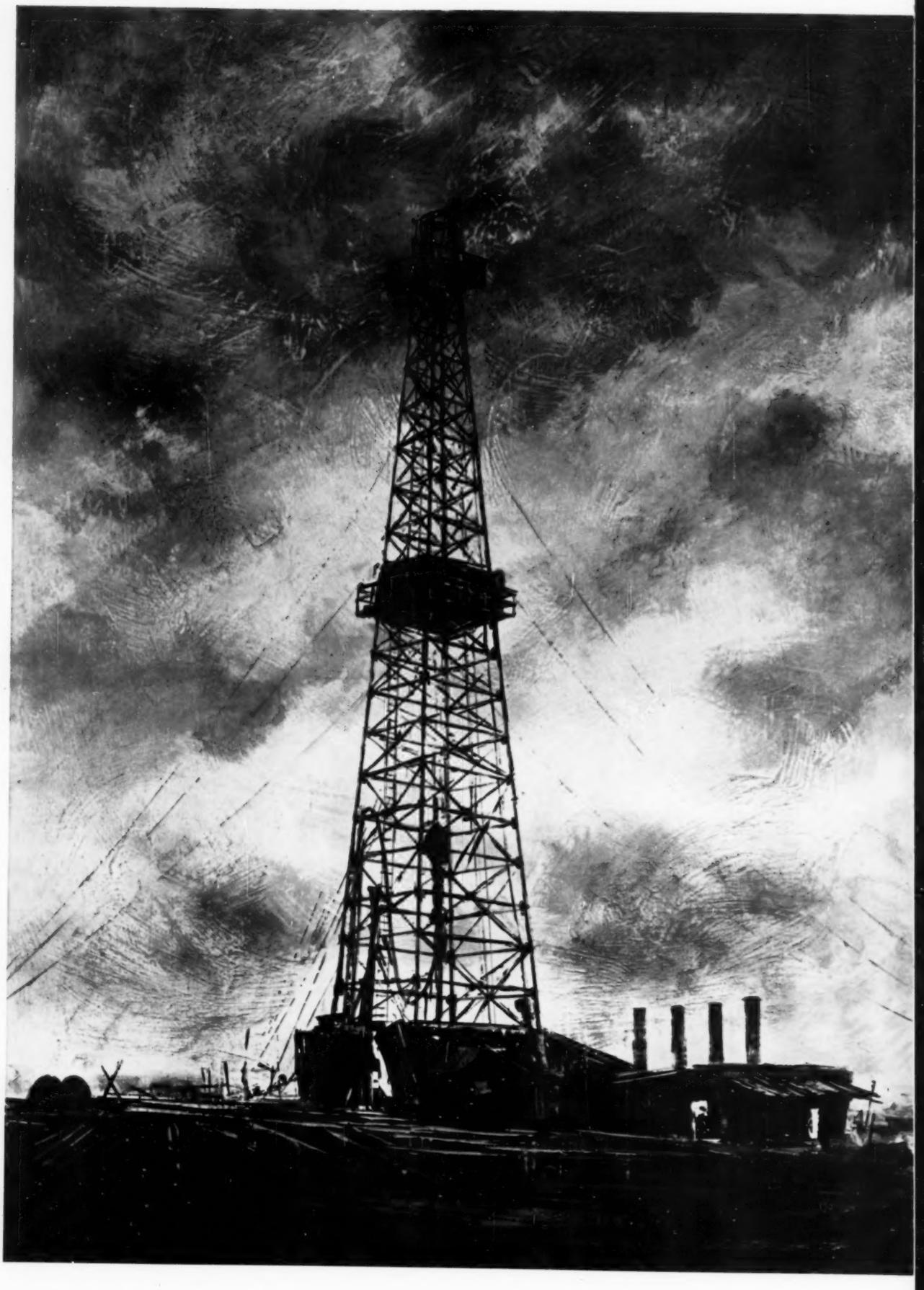

Fourth in a Series — "Evolution of the Rock Bit"

NEW ERA IN DRILLING PROGRESS INTRODUCED

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THE DAWN of a new era in rock bit designing and the first long step toward the development of modern drilling techniques came, in 1933, with the introduction of the Hughes unit-type three-cone bits, equipped with self-cleaning cones. Self-cleaning cones were first proved on the Simplex bit in 1925.

The three points of rolling contact on bottom made the three-cone bit (later identified as "Tri-Cone") smoother running. The 50% more gage surface, fortified with tungsten carbide, made it possible for the three-cone bit to better hold the gage of the hole.

The unit-type "Tri-Cone" design triggered a rapid series of developments. It permitted Hughes engineers to concentrate on designing cutting structures to drill specific formations. And during the mid-30's, Hughes brought out its "tailor-made" bits — "a bit for every formation."

Instead of an all-purpose bit (which the first "Tri-Cone" bit had been), the "tailor-made" bits included the "S" bit for soft formations; the "OSQ" for formations on the softer side of medium hard; the "D" for medium hard formations; the "W" for hard formations, and the "HR" for extremely hard, abrasive formations. The unit two-cone bit was used primarily to dig soft, broken formations, and, today — greatly modified in design — is still used primarily for this purpose.

For their time, the "tailor-made" bits were a sensation. They tripled the rate of penetration and doubled the footage drilled per bit. Their success gave added emphasis to research and spurred the efforts of Hughes engineers. Each new advance opened the door to still further improvements, and step by step led to the present-day, high-performance, highly specialized Hughes bits.

West Texas, with its high percentage of hard and extremely hard abrasive formations, was a proving ground for the first "Tri-Cone" bits. As an example, take Gulf's J. T. McElroy 103—a record deep well for its time—12,786 feet. It took 26 months—March 21, 1933 to May 25, 1935—and 965 bits to drill this well. The lessons learned in those 26 months helped to speed the development of tailor-made "Tri-Cone" bits. In the illustration at the left, the artist has pictured the Gulf McElroy as it appeared while drilling in 1935. Large reproductions, suitable for framing, are available for the asking. Write: Adv. Dept., Hughes Tool Co., P. O. Box 2539, Houston, Texas.

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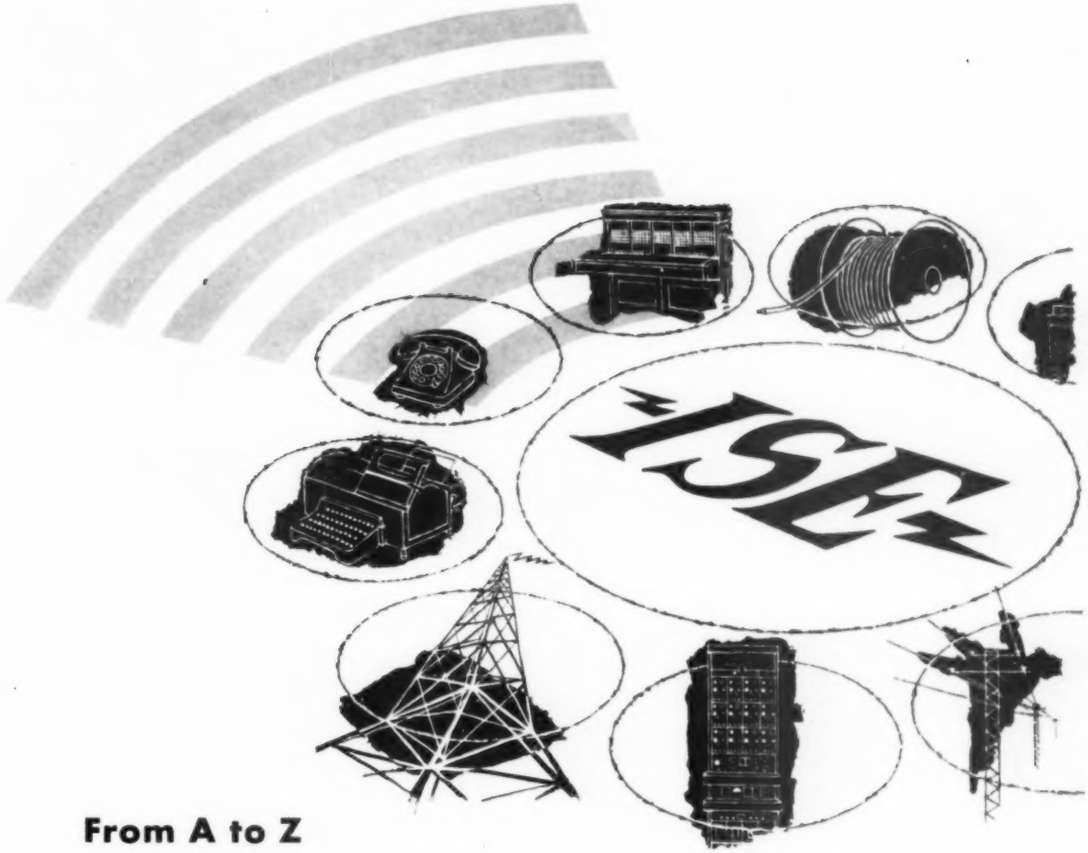

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LATIN AMERICAN OIL NEWS

Venezuela's Oil Minister Reports

The Minister of Mines and Hydrocarbons, Dr. Juan P. Perez Alfonzo, was asked recently to appear before the House of Representatives to review Venezuela's oil policy and to answer questions on oil matters. This was the first time in many years that this practice had been put into effect, and the Minister read a lengthy two hour report on Venezuela's oil policy. Here are some of the major points:

Demand: World conditions seem to be favorable for Venezuelan oil, demand will increase, and the consuming countries will try to find new sources of supply, therefore demand will eventually increase for Venezuela's crude.

U. S. Imports: There is a possibility of reaching an agreement with the United States on quotas. Venezuela will be the one to distribute those quotas among the producing companies presently operating in this country. Similar quotas could be established for the Middle East countries in the event that they had the intention and the mechanism to regulate their production.

British Memorandum: The memorandum sent by Venezuela to the British government on the price drops announced by the British Petroleum Co. had as a purpose to warn that country, or any other country which could possibly adopt a similar position, that such an attitude will place them in an unfavorable position if they should ever need Venezuelan oil to solve an emergency.

National Oil Company: Venezuela intends to create as soon as possible a National Oil Co.; its financing is not considered a problem, yet the government needs more time to study the idea because of the magnitude of the project.

Gas: There is a study presently being carried out by the government on a national gas distribution system and on the installation of national liquid gas plants.

Cairo: In order to carry out some of the recommendations made at the Cairo Oil Congress, a system will be established for direct consultation among the oil agencies of the countries involved.

Markets: Oil demand is and will be so great that the producing countries do not have to go looking for markets. "Venezuelan oil is here: those who need it can come and get it."

Conservation: The matter of the possible use by the government of wasted gas raises a legal point which is presently under study by the government.

Concessions: Before the government revises the validity of the concessions granted by the former dictatorial government it will have to check the economic side of the operation. It might be that they are not worth what the companies paid for them and buying them back might result in a financial loss to the nation.

Oil Commission: The newly formed "Coordinating Commission for the Conservation and Commerce of Oil" has enough authority to enforce its decisions. If those decisions were not obeyed by the companies, the commission may impose fines according to its bylaws or may ask Congress for greater powers if the specific cases require it.

Oil Labor Bill In Venezuela

The Venezuelan House of Representatives has received a proposed new law to prevent mass firings by the large oil companies. According to Union officials, over 5,000 men have lost their jobs with the oil companies in a three month period. Rep. Aristides Galvani, who introduced the bill, said: "Industrial enterprises with great earning power such as the oil companies operating in this country, ought to be able to maintain their working force through the "tough" days. We do not consider personnel reduction a valid reason as claimed by the companies." Galvanis' proposed law would control the percentage and the actual number of men who could be fired for "valid" reasons in a given period of time. The definition of "valid reason" would be determined by labor authorities after careful consideration of each case.

Representative Andres Hernandez supporting the proposed new law said: "During the earlier years of the dictatorial regime 60,000 workers produced 1,500,000 barrels of oil per day, while today some 45,000 men are producing almost double that amount. The companies are reducing personnel on the basis that they are making less money, which we do not feel is correct." It is believed that personnel employed by the oil companies themselves fluctuate very little. Contractors, however, engage large amounts of help for limited periods and have to let the employees go when the contract work is finished. They have large swings in employment, therefore, and particularly recently when oil company budgets have been curtailed.

ENI Contract In Argentina

YPF in Argentina has signed a contract with Societa Azionaria Italiana Perforazioni e Montaggi to drill 300 oil wells in the south flank of the Comodoro Rivadavia area. Total payments are expected to be the equivalent of 13 million dollars.

SAIPEM is a subsidiary of the Italian state oil agency, Ente Nazionali Idrocarburi. The contract is subject to approval by governments of Argentina and Italy. Terms call for SAIPEM to drill 45 wells the first year, up to 165 the second and the rest by the end of the third year. Wells are expected to be 1,400 to 1,800 meters deep. SAIPEM is to be paid the equivalent of $20.50 per linear meter drilled and $50 per hour of work on well terminations.

YPF is to furnish casing, tubing, pumps, valves and other equipment, and payments are to be for services only. YPF also will pay taxes on company operations with the exception of payroll taxes and social welfare levies. Company must set up a bank guarantee of $130,000 until it has begun work and must operate at least five drilling rigs at the same time.

62% of the payments will be in Italian lira, and the company will finance these payments for four years at 8% interest. 25% will be in Argentine pesos, convertible to dollars at the rate of 65 pesos to the dollar. The remaining 13% will be in Argentine pesos convertible to dollars in the free exchange market.

The SAIPEM agreement brings to 1,800 the number of wells which YPF has contracted with foreign companies to drill in the area in the next three years.

Pan Am Pipeline In Argentine

Pan American Argentina Oil Co. will build a crude oil pipeline of 85 miles from Sarmiento to the coastal town of Caleta Cordoba, it is announced. The line will have a capacity of $12\frac{3}{4}$ inches from Sarmiento to Cerro Dragon and of 14 inches on the Caleta Cordoba. The line is expected to be installed by January 1960.

The line is expected to carry 12,600 b/d at the start and by the end of 1960 to carry 35,000 b/d. The capacity could be raised to 50,000 b/d by adding pumps in case of emergency. Oil will be loaded on tankers at Caleta Cordoba for shipment to YPF refineries. Line will have a $100,000 automatic metering device to measure oil delivered to YPF.

Pan American will pay the costs of the line. Under its contract of July, 1958, Pan American agreed to construct a pipeline to move its production to the sea if it decided to continue its operations beyond the first year. After 20 years, the pipeline becomes property of YPF. YPF announced that Pan American will have invested a total of $20 million dollars in Argentina by the end of 1960.

New Argentine Pipeline

YPF said that a crude oil pipeline has been placed into service between Guemes, Salta Province, and Tucuman and that it will allow pumping of crude from Campo Duran to Tucuman.

The line is $12\frac{3}{4}$ inches in diameter. It is part of a line being constructed on to San Lorenzo, Santa Fe Province, and due for completion early in 1960. The oil will be carried from Tucuman to San Lorenzo, where YPF has a refinery, by rail.

Throughout to Tucuman was not given, but officials explain that the line will mean a raise of production of the Campo Duran field to 1,700 cubic meters daily in June, 1959, compared with 1,150 cubic meters in March, 1959.

Argentine Production Up

Dr. Horacio Legaretta, president of YPF in Argentina, said that crude oil production by YPF in the first four months of 1959 was 106,667 d/d, some 31% greater than a year earlier. He stated that Argentina would definitely achieve self-sufficiency in oil by the end of 1961.

He further said the Loeb Rhoades group, which has a contract covering areas of Mendoza and Santa Cruz, has planned production of 2,500,000 barrels of oil in 1959 and 8,190,000 barrels per year from 1960 through 1964. Argentine production last year was 35,751,000 barrels.

8,500 Bbl/Day Venezuelan Well

Signal Oil and Gas of Venezuela's first dual completion for its joint venture in Lake Maracaibo, Venezuela, flowed at the rate of 8,500 b/d. The new development well, Centro 18, produced 27.4 degree gravity clean oil from the C-2 Eocene zone and 38.3 degree gravity clean oil from C-5 Eocene sands. The tests, which lasted four hours, were made in intervals from 10,145 ft. and 12,372 ft. Tubing pressure on the C-2 string was 900 pounds per square inch, while the C-5 string recorded 1,120 psi. Signal has completed 16 wells in the large mid-lake concession and currently is drilling 3 additional wells.

Oil Wage Up In Colombia

Shell Petroleum Co. has signed a new two-year contract in Colombia giving a general 14% increase. The company also agrees to curb its dismissals of employees and to a three-part committee of government, industry and labor to settle grievances.

Shell also agreed to give interest free loans of 8,000 pesos to workers for construction of their homes; a three pesos a day increase in the rent allowance; proportional payments for vacations after six months; to freeze prices of meals at the canteen at one peso per meal; to maintain low hospital and medical care for workers and their families and to construct primary schools at Barrancabermeja and Puerto Milches for workers' children. Workers for contractors for Shell are to receive the same benefits as those employed directly by Shell.

Pemex To Buy In Europe

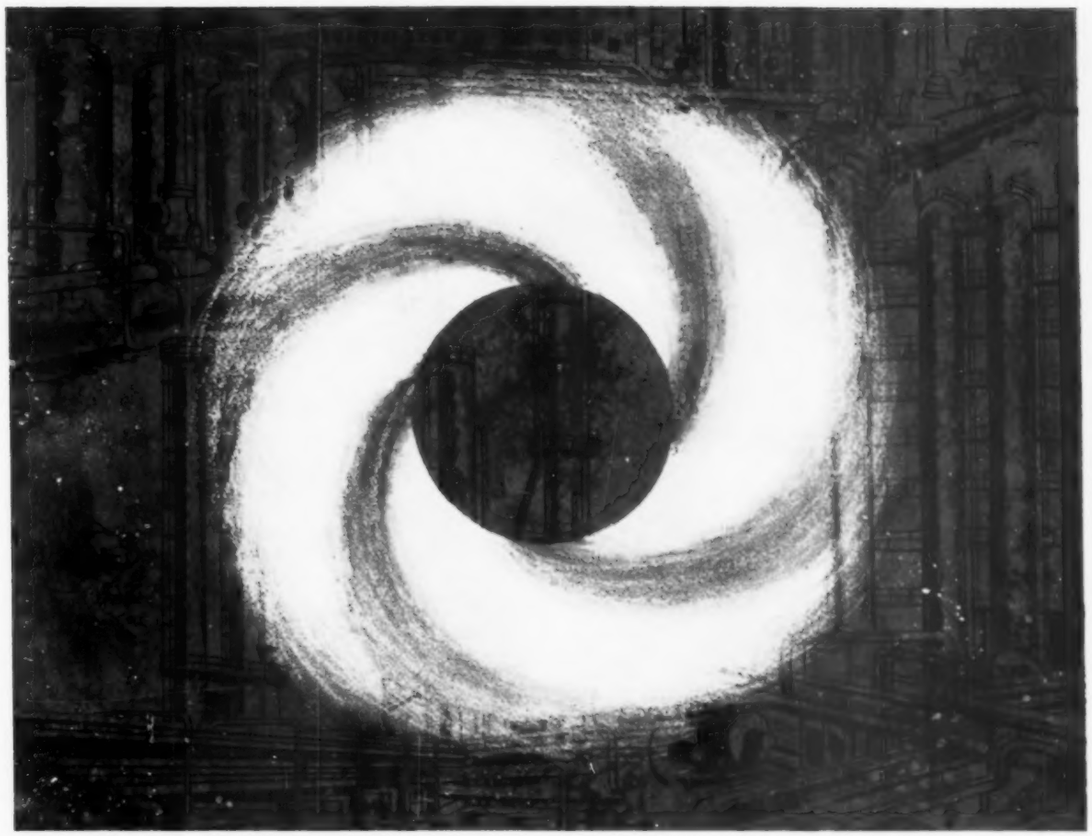
Petroleos Mexicanos has decided to concentrate its purchases of petroleum equipment in the future in Europe. Until recently, this market had been served almost exclusively by U. S. suppliers.

In recent loans and credits to Pemex, the government agency has contracted to buy some $72.5 million worth of petroleum equipment over the next few years from common market countries of Europe. One credit for the equivalent of $42.5 million by a group of French banks for five years at 5 to 6% interest, is reserved for the purchase of petroleum industry equipment in the European common market.

Another, the equivalent of $9.8 million, came from British Oil Equipment Credit, Ltd., as a line of credit for purchase of machinery and equipment. The credit extends for five years at 5.5%.

A group of Mexican banks have agreed to lend Pemex the equivalent of $7.5 million. Pemex has said that the loan would be used for purchase of common market equipment. In one more line of credit, The Lummus Company of New York, has agreed to advance the equivalent of $7.56 million for five years at 6% interest for work on a catalytic cracking plant at the refinery at Salamanca. The credit will cover Lummus engineering fees and cost of equipment which Lummus is to select and install.

The significant fact about the peso loan from the Mexican banks is that the Deputy Director of Pemex for Finance, Licenciado Fernando Padilla, has said that it would be used for common market equipment purchases. U. S. officials have been informed that Pemex has decided to concentrate their purchases of petroleum equipment in the future in Europe. The statement of the deputy director would seem to support the report.



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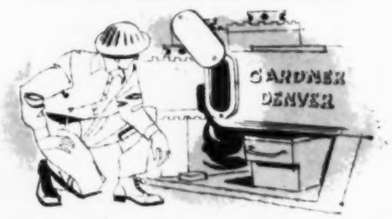

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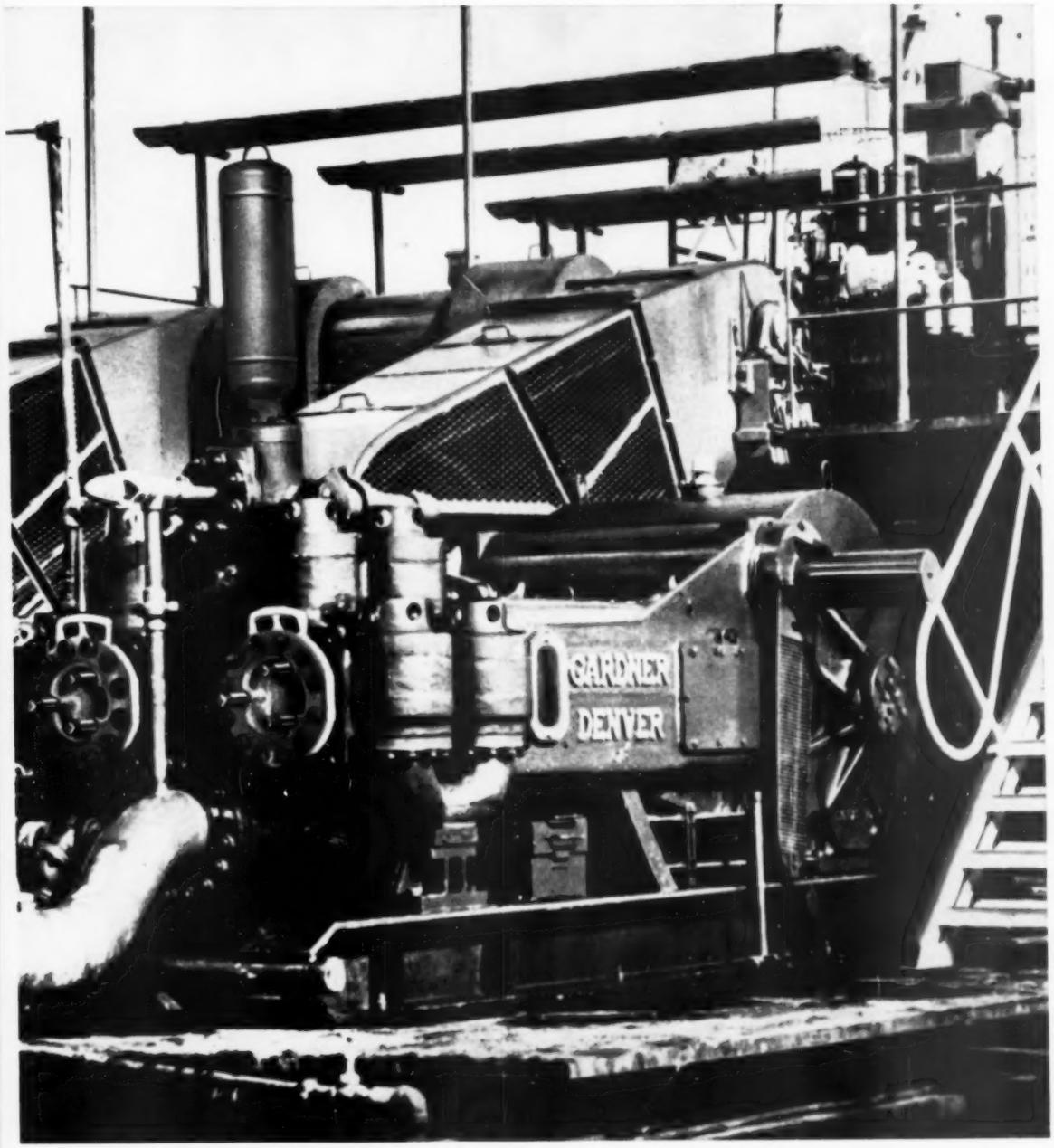

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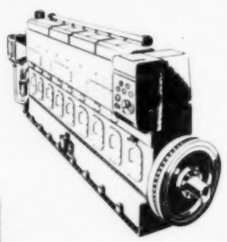

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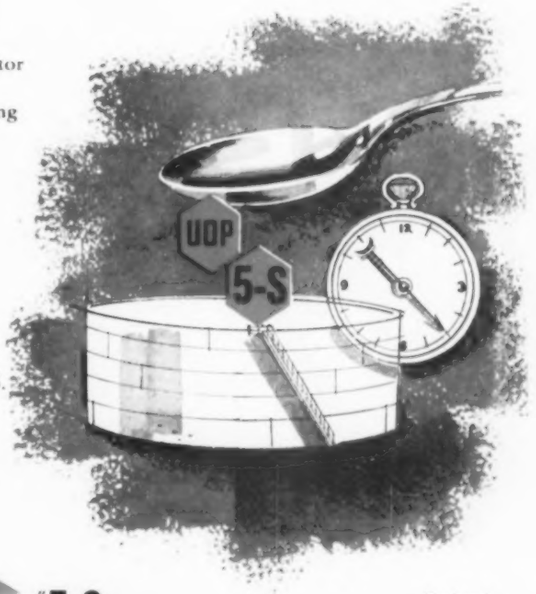

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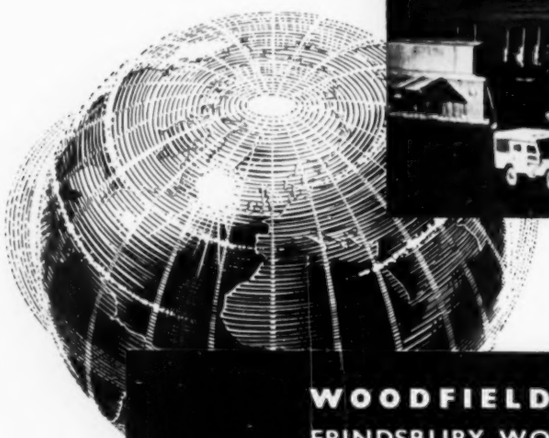

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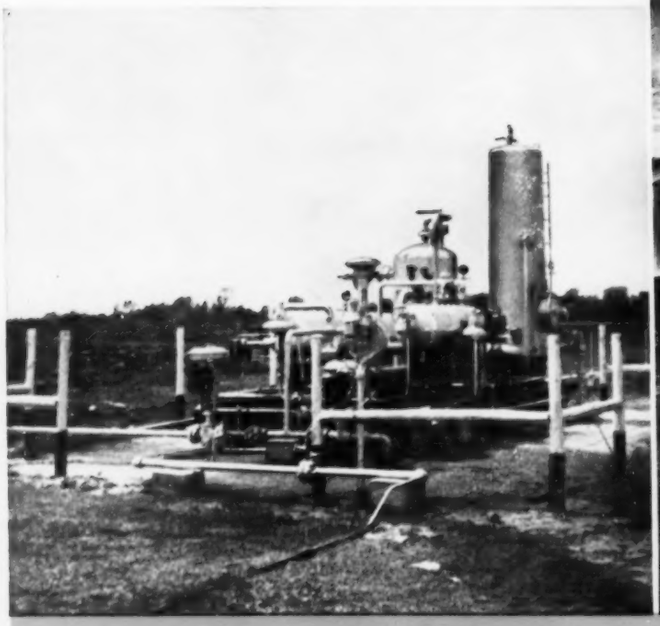

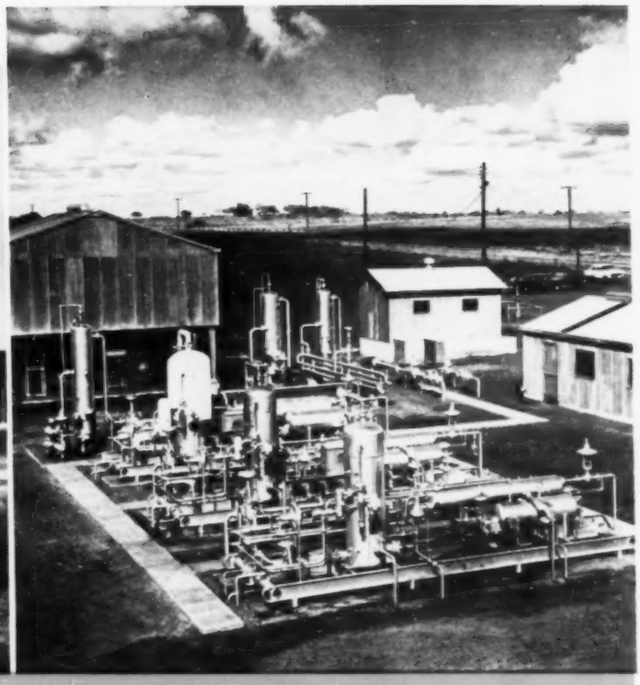

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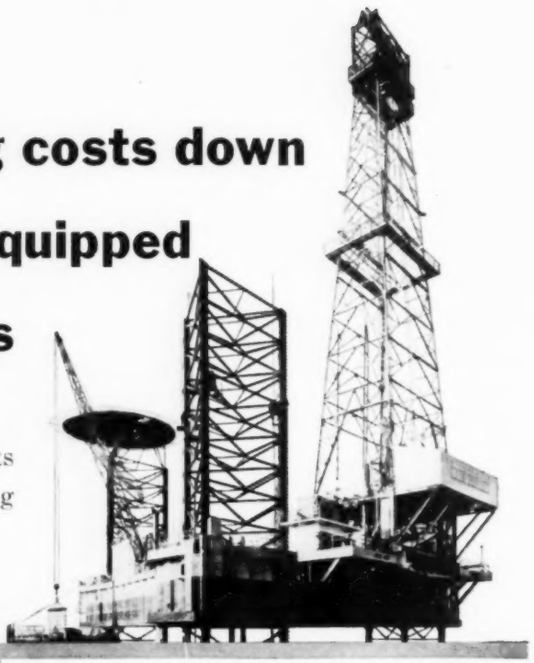

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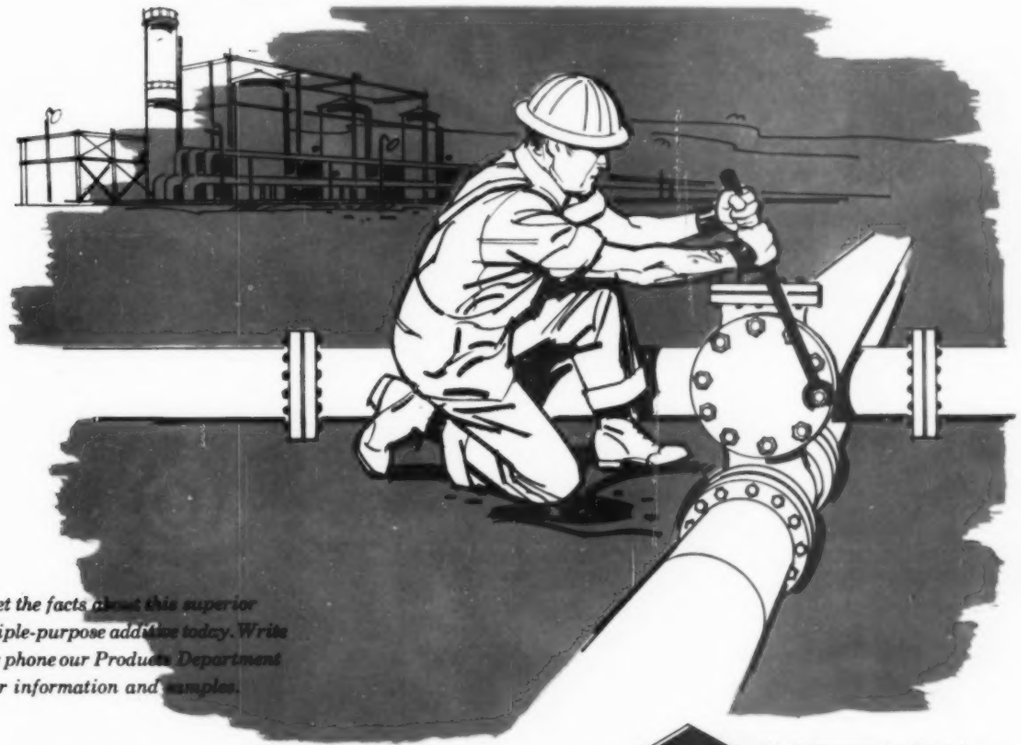

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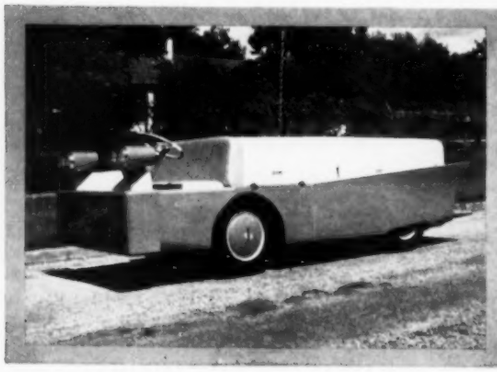

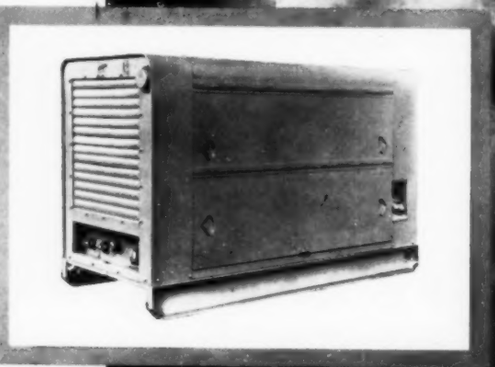

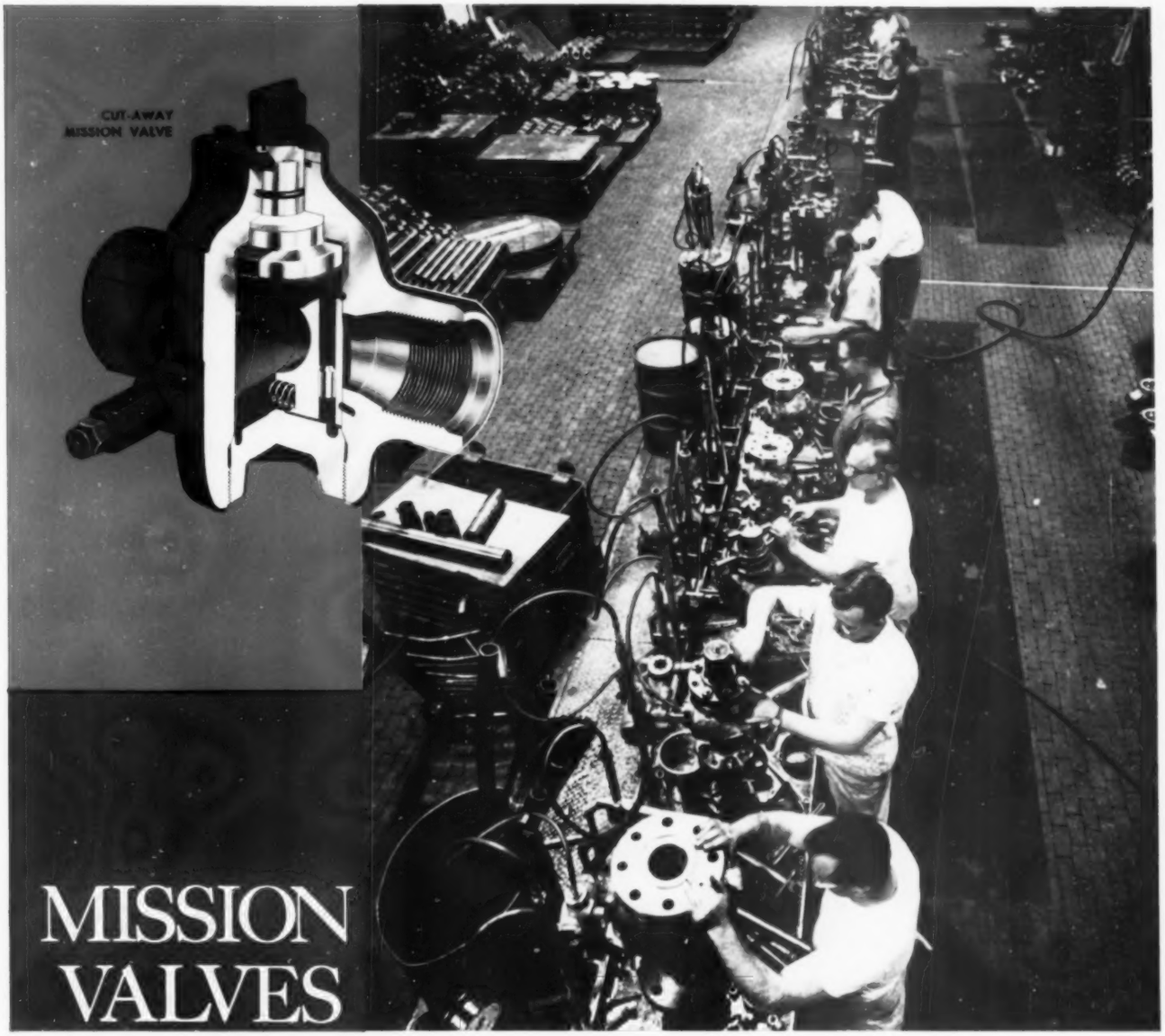

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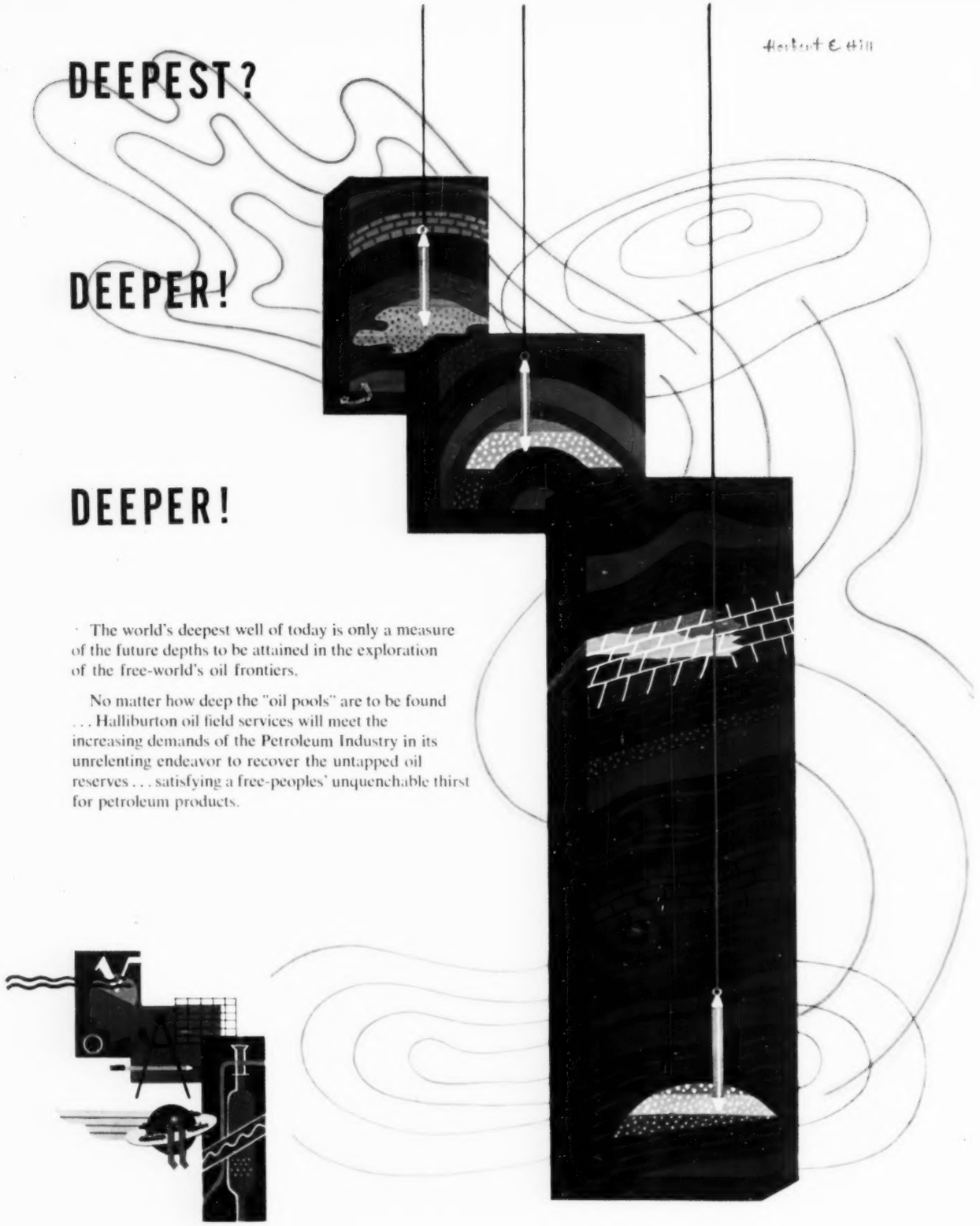
DEEPER!

DEEPER!



The world's deepest well of today is only a measure of the future depths to be attained in the exploration of the free-world's oil frontiers.

No matter how deep the "oil pools" are to be found . . . Halliburton oil field services will meet the increasing demands of the Petroleum Industry in its unrelenting endeavor to recover the untapped oil reserves . . . satisfying a free-peoples' unquenchable thirst for petroleum products.

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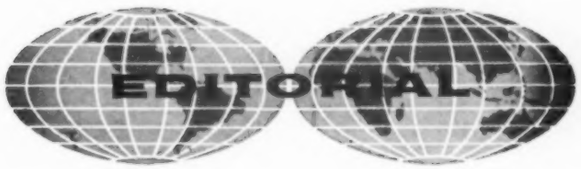

Sound Conservation Policy Needed

The petroleum raw materials situation in the United States today is one of strange contrasts.

New oil is difficult and costly to find and yet the importation of flush foreign oil is severely restricted. There is less oil in sight for the long pull but more than at any time in recent years available for quick lifting.

In the past eight years domestic demand for petroleum in the United States has risen 56.18 percent and in the same period reserves of crude oil and natural gas liquids have increased only 29.47 percent. Result of the unequal rate of expansion of demand and supply of domestic raw material is that reserves have fallen 19.57 percent when measured by years' supply.

The shrinkage of reserves when compared with consumption is indicated by the following figures showing the reserves of crude oil and natural gas liquids in terms of years' supply at existing rates of domestic consumption.

1950.....13.8	1953.....12.4	1956.....11.3
1951.....13.6	1954.....12.4	1957.....11.2
1952.....12.4	1955.....11.5	1958.....11.1

This is a peculiar record when, at the same time we find the producibility of U.S. fields to be growing year by year so that the pressure on markets is strong enough to overturn a national government policy of long standing and severely limit imports from flush foreign fields.

With reserves falling year by year producers have complained that it is difficult to find promising new wildcat locations to test. The ratio of commercial discoveries to total wildcats drilled has not diminished materially but the size of new fields has fallen sharply. There have been no major strikes in recent years.

Excess producibility of fields in the USA may be attributed partly to improvement in stimulation techniques and to secondary recovery operations. A major factor, however, is spacing of wells in proven territory. Under today's market conditions there is seldom economic justification for fill-in drilling in proven territory. In some fields it can be demonstrated that such drilling may never pay out, or the return of capital may be years away. This is particularly true in tight formations. The Sprayberry district is a prime example of an area in which close spacing is not the answer to profitable operations.

National interest in the United States should dictate a policy which will have the two-fold effect of encouraging new discoveries and of building up reserves to a more satisfactory level. This can be accomplished by a handful of individual states through proper regulatory action. To do so the state authorities regulating production need only to do two things. One is to grant large increases in allowables to discovery wells for periods long enough for the wildcatter to recover his cost plus a factor which will take into account the risks taken in seeking new oil. The second step, the converse of the first, is to severely penalize wells drilled on a close spacing pattern by reducing the allowables of such wells. As a hypothetical example, suppose the first development well on a 160-acre tract is granted an allowable of 200 b/d, the second well 60 b/d and the third and fourth wells 20 b/d. There is little doubt that the small operator would have difficulty in financing drilling on a 40- or 80-acre pattern under some such plan. The larger company also would be similarly restrained by any prudent management even though finances were available.

The President's Cabinet Committee which has restricted imports "in the interests of national defense" could be a powerful force in a true defense program to build domestic reserves by sponsoring a rational plan to stimulate wildcatting and discourage close well spacing.

The Interstate Oil Compact Commission is a proper forum in which various methods can be developed through discussion and debate for the purpose of achieving true conservation for a possible future emergency.

Courtesy of N. Y. Historical Society, N. Y. City.

Colonel Drake on Fifth Avenue

This photo, recently uncovered by Kendall Beaton of Shell Oil Company in the files of the New York Historical Society, was made from an old stereopticon slide and shows Fifth Avenue, looking south from 14th Street, at a time when it was New York's most fashionable residential district.

Most oil photos of this early period illustrate oil production in the Titusville area. This picture, taken in the winter of 1864-65, shows an aspect of the early industry that is less well known: the activity of New York financiers and speculators in oil-stock promotion. Colonel Drake, after drilling two more wells adjacent to his original Titusville discovery, served as local Justice of the Peace and oil broker. Taking some $15,000 to $20,000, in 1863 he left for New York where (you guessed it) he became involved in oil-stock promotion.

This float, carrying a regulation boiler and full-scale oil derrick ("Wm. H. Smith, Builder" according to one of the many signs) was no doubt the good Colonel's idea. He can be seen on it, big as life, second to the left from the derrick. Other worthies, according to Mr. Beaton's identifications, are Uncle Billy Smith (Drake's driller and builder of this demonstration rig) directly in front of the boiler smokestack; and James M. Townsend, New Haven banker who financed Drake's original well, third from the right, at front.

The Tarr Farm Petroleum Co., Blood Farm Petroleum Co., Home Petroleum Co. and Central Petroleum Co., whose shares were advertised to New Yorkers by means of this graphic demonstration, were all successful enterprises based on some of the earliest producing properties in the Titusville area.

Success, however, had a way of eluding poor Drake. A few years later a Titusville friend discovered him broke and ailing with arthritis in New York, took up a collection to move him and his family back to Pennsylvania where he died, a pensioner of the state, in 1880.

But it was Drake who had made possible the proud boast flaunted on the placard atop this derrick float: "Oil is King Now, Not Cotton."

World drilling up 17%

Rotaries active outside the United States have risen sharply and in about seven years are predicted to equal the U.S. total. Argentina and Libya show sharpest increases this year.

THE number of rotary rigs operating around the world has risen sharply from a year ago. The increase is about 16.9%, and is largely attributable to increased activity in the United States, Argentina, Africa and the Far East. These figures refer only to rotary rigs operating, engaged in exploratory drilling. There are other rotary rigs, almost equaling the total of exploratory rigs, engaged in workover operations, development drilling, etc., plus an additional amount of cable tool rigs, which are not included in this survey.

Western Hemisphere: The recent oil contracts in Argentina with Pan American, Union Oil, and others have stimulated drilling in that country to record levels. The increase over last year's July 1 is striking, due mostly to rigs shipped in under the new contracts. Pan American shipped in 10 rigs via Loffland Bros., and Carl M. Loeb, Rhoades Co. (referred to as "El Banco" in Argentina) is drilling actively on their area as well. Recently contracts have been signed with Tennessee Gas Transmission, Southeastern Drilling, AGIP (subsidiary of Ente Nazionali Idrocarburi, the Italian government's oil entity) and other companies such as Shell and Esso, which will double the total number of rigs drilling in a year or so.

Drilling in the United States has continued to undergo substantial improvement, with a total of 2,284 rotary rigs actively making hole on June 23rd. This is exclusive of rigs engaged in logging, cementing, fishing, testing and other operations. The increase is probably due to the rise in U.S. production following imposition of the import restrictions which cut down the amount of outside oil coming in. It is likely rigs will remain above the 2,200 level and probably will reach 2,300 some time later this year. Total rotary plus cable tool rigs active reached 4,175 at the end of April in this year and the total illustrates the improving vistas for drilling contractors—especially since the number of rigs available for making hole is smaller than anticipated, with consequent good effects on contract prices.

Eastern Hemisphere: The principal increase in drilling activity over the past year has occurred in Africa, especially in Libya. There, some 15 rigs are operating and by the end of the year they will number 20. Operators are striving to prove up some of their acreage in this very promising oil patch and they have only a year and a half to do it, since that time they will be required to surrender 25% of their present acreage.

Not all their effort is going into oil well drilling. There are 14 water rigs drilling as well, supplying the wildcats plus 25 seismic parties.

The USSR is not included in the accompanying table, nor are other Communist countries. The total of rigs operating in Russia, including both turbodrills and rotaries, is estimated at 850. No estimate is available for the other Communist countries.

In Western Europe the number of rigs remains stable, but may be expected to rise shortly when companies go into Spain under the new oil law. Some 20 companies are interested, not only in Spain but in the Spanish Sahara as well. Greece is also inviting international capital. At least one major oil company is entering there shortly.

Drilling in the Far East remains unchanged, with the notable exception of Australia where a huge structure is being drilled in Queensland by Delhi Taylor and something approaching a land boom is starting, stimulated in part by the recent oil discoveries in Papua.

ROTARIES DRILLING AROUND THE WORLD

	JULY 1, 1959	YEAR AGO
NORTH AMERICA		
Alaska	4	3
Canada	152 (June 23)	154
United States	2,284 (June 23)	1,852
TOTAL	2,440	2,009
CENTRAL AMERICA & CARIBBEAN		
Bahama Islands	0	1
British Honduras	1	2
Barbados	0	1
Costa Rica	1	1
Cuba	4	4
Haita	0	1
Mexico	119 (Jan. '59)	116
Trinidad	34	33
TOTAL	159	159
SOUTH AMERICA		
Argentina	80	65
Bolivia	17	16
Brazil	54	30
Chile	4	4
Colombia	17	17
Ecuador	4	4
Paraguay	1	0
Peru	10	13
Uruguay	1	1
Venezuela	105	93
TOTAL	293	243
AFRICA		
Algeria (OCRS)	38	37
Angola & Cabinda	4	2
Belgian Congo	1	1
Egypt	4	4
French Equatorial Africa (Cameroons, Gabon, M. Congo)	11	10
French West Africa	2	2
Libya	15 (June)	7
Madagascar	3	3
Morocco	2	2
Mozambique	5	6
Nigeria	9	9
Senegal	1	2
Somalia	1	2
Somaliland Protectorate	1	1
Tanganyika & Zanzibar	1	1
Tunisia	2	2
Union of So. Africa	0	0
TOTAL	100	91
EUROPE		
Austria	34	32
Cyprus	0	0

Europe (continued)	JULY 1, 1959	YEAR AGO
Denmark	0	1
France	50	50
Germany (West)	141	140
Greece	0	0
Italy (incl. Sicily & Sardinia)	36	36
Malta	0	1
Netherlands	3	3
Portugal	2	2
Switzerland	0	1
Spain	3	3
Yugoslavia	16	16
TOTAL	285	285
MIDDLE EAST		
Afghanistan	0	2
Bahrain	1	1
Iran	9	8
Iraq	9	8
Israel	4	6
Jordan	1	1
Kuwait	6	6
Neutral Zone (Kuwait—Saudi Arab)	6	5
Muscat & Oman (Incl. Dhofar)	2	2
Qatar	1	1
Trucial Coast (Abu, Dhabi, Sharjah)	2	2
Syria	1	2
Saudi Arabia	3	3
Turkey	6	5
Yemen	0	0
TOTAL	51	52
ASIA AND AUSTRALIA		
Australia	6	4
British Borneo (Brunei & Sarawak)	2	2
Burma	3	3
Formosa (Taiwan)	6	6
India	6	5
Indonesia	16	16
Japan	17	15
Netherlands New Guinea	1	1
New Caledonia	0	1
New Zealand	1	0
Papua & Brit. New Guinea	3	3
Philippines	2	1
Thailand (Siam)	1	1
Timor	1	0
TOTAL	65	58
TOTAL EASTERN HEMISPHERE	501	486
TOTAL WESTERN HEMISPHERE	2,892	2,252
TOTAL WORLD	3,393	2,738

Turbodrilling progress and new drilling methods in the USSR[1]

by
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THE amount of turbodrilling in oil and gas fields of the USSR increased from 65% of all drilling work in 1955 to 86.5% in 1959. The use of turbodrills has increased the drilling rate; in the period 1955 to 1958 the average commercial rate of drilling increased from 896.4 (meters) per drilling rig per month to 1,210 m. per drilling rig per month and the average penetration rate all over the USSR increased in the same period from 9.31 m/hr (meters per hour).

In eastern oil areas where wells of 2,000 m. in depth are drilled in hard formations within 10-15 days, the average penetration rate is 20-30 m/hr and the average meterage per bit is 30-40 m.

In southern areas where wells of the same depth are drilled in plastic formations within 9-12 days, the average penetration rate is equal to 40 m/hr and the average meterage per bit exceeds 200 m.

The considerable increase in the turbodrilling rate has been achieved by an increase in the bottom-hole power and by a decrease in the hole diameter from 2¾" to 7½".

Research work aimed at improving the technique of turbine drilling is subordinated to the task of solving the problem of high-speed drilling of deep wells.

A number of turbodrills have been developed for drilling deep 9½", 8½", and 7½" diameter wells. Besides, turbodrills with small-diameter bits (5⅝" and 4⅝") have been developed.

The reliability of sectional turbodrills (Fig. 5) has been improved by the use of conical threads with adjusting springs. The springs adjust the torque applied to the stator system in section connections. This has made it possible to increase the number of stages up to 350 and more.

Research into friction in the turbodrill thrust bearing has led to the development of rubber-metal thrust bearings working in a fluid medium. In the medium of real drilling fluids friction losses in such bearings approach those in roller bearings.

The use of plastic materials for manufacturing turbodrill parts instead of steel castings has reduced turbodrill cost in spite of a considerable increase in stages. This resulted in a material improvement of hydrodynamic characteristics and erosion resistance of the turbines.

New Cone-Bit Designs: The problem of the life of a rock bit bearing has been solved by essentially new bit designs. The weight-on-bit is taken up immediately by the cones, bypassing the bearings.

When bits with unloaded bearings (Fig. 1) are used, the weight-on-bit is transmitted by a guide collar through the guide collar bearing to the back cone of the cutter. The RPM of the bit will be equal to that of the turbodrill because the upper part of the guide collar is connected to the turbodrill and splined to the body of the bit.

In the differential bit (Fig. 2) the weight-on-bit is transmitted to the cones through a guide collar which rotates freely in the body of the bit.

The system combining the guide collar, cones, and the bottom-hole, works as a differential reduction gear, and therefore the speed of the rotation is lower and the torque on the bit is higher than that of the turbodrill shaft.

Research on strains in the differential pins under loading in the process of drilling has shown a considerable reduction in differential bit strain, guaranteeing a longer bearing life.

The low-torque bit has rolling cones and is designed for the use in plastic formations. The teeth are of essentially new design.

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[1] Presented before 1959 Fifth World Petroleum Congress, New York, N. Y., June 1959.

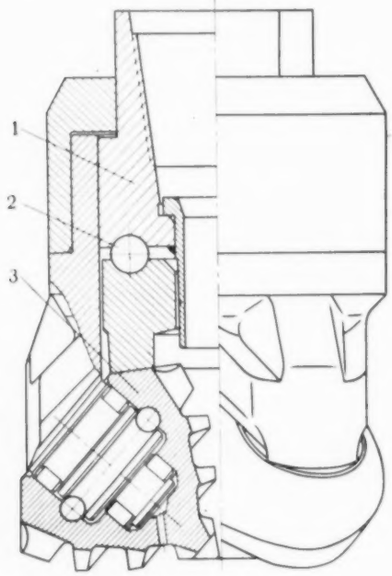

Fig. 1. Bit with Unloaded Bearings.

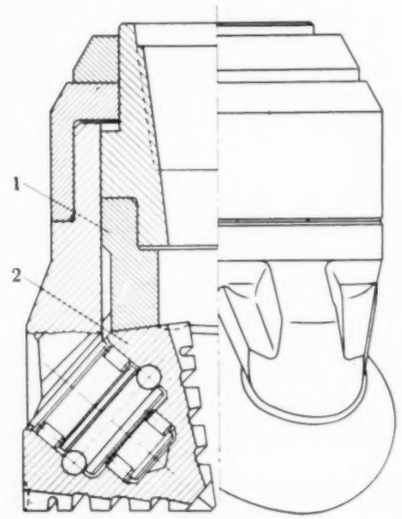

Fig. 2. Differential Bit.

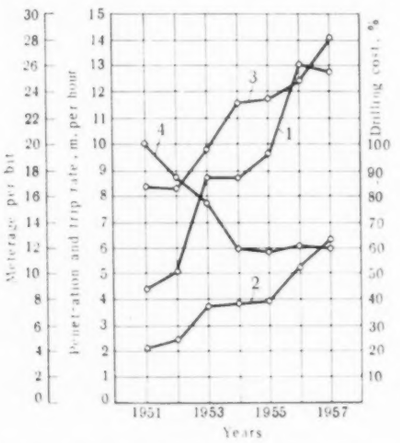

Fig. 3. Average Results of Electrodrilling. 1) Penetration rate. 2) Trip Rate. 3) Average Meterage per Bit. 4) Drilling Costs in Arbitrary Units.

The cutters are the single-conic, self-cleaning type. Self-cleaning is achieved by using four cutters, two of which gauge the hole. The arrangement of the cones and the gauging allow minimization of torque requirements for rotating the bit at a given weight-on-bit. When drilling with such bits in any formation, the specific torque values are considerably lower than in the case of penetrating the same formation with conventional three-cone bits having multiconic cutters. This bit is designed for drilling deep wells at high weights-on-bit. The application of the new cone-bit types increases meterage per day in deep wells, especially when using small-size bits.

Drilling with diamond bits guarantees large meterage per bit; however it is impossible to obtain faster drilling progress in deep wells if penetration rates are low. Tests have shown that an increase in circumferential velocity up to 20 m/sec does not affect diamond bit wear resistance. Turbodrilling with diamond bits is especially promising in slim hole drilling where the development of long-wearing small size cone bits is the most complex problem.

Electrodrill: Deep and directional wells are successfully drilled in the Soviet Union by means of electrodrills. Field results of electrodrilling for Devonian pay sediments in the hard formations of the Tuimaza oil area/Bashkir ASSR are graphically illustrated in Fig. 3.

The rig layout for deep electrodrilling is shown in Fig. 4. Electric power is supplied to the electrodrill with the aid of cable through collector 2. Separate sections of the cable are mounted in the drill pipes. Each cable section has a male contact at one end and a female contact at the other which engage when the drill pipes are made up. The cable sections connected in such a way constitute an unbroken feeder line.

The electrodrill (Fig. 5) consists of two main parts—an oil-filled electric motor (1) and an oil-filled spindle (2). The bit (3) is connected to the shaft of the spindle.

The housings of the electric motor and spindle are connected by means of cone threads, their shafts being connected through a toothed coupling. The electrodrill motor is asynchronous, three-phase, alternating-current with a shorted rotor. Characteristics of manufactured electrodrills are given in Table I.

The power cable permits drilling with continuous control of the deviation angle, hole azimuth, and the deflection device azimuth without time and labor-consuming round-trips, all factors of great importance in directional drilling.

The above-mentioned angles are observed by three pointer instruments during the process of drilling. This is possible due to a special inclinometer mounted in the drill pipe above the electrodrill. The inclinometer operates on the time-impulse principle which ensures measuring the azimuth and the deviation angles to within ±0.5 degree.

The process of electrodrilling is automatic and accurately controlled. Optimum performance of the electromotor is effected without hand control in the process of drilling. The electrodrill allows use of new technique, thereby extending the sphere of effective use of bottom-hole drives.

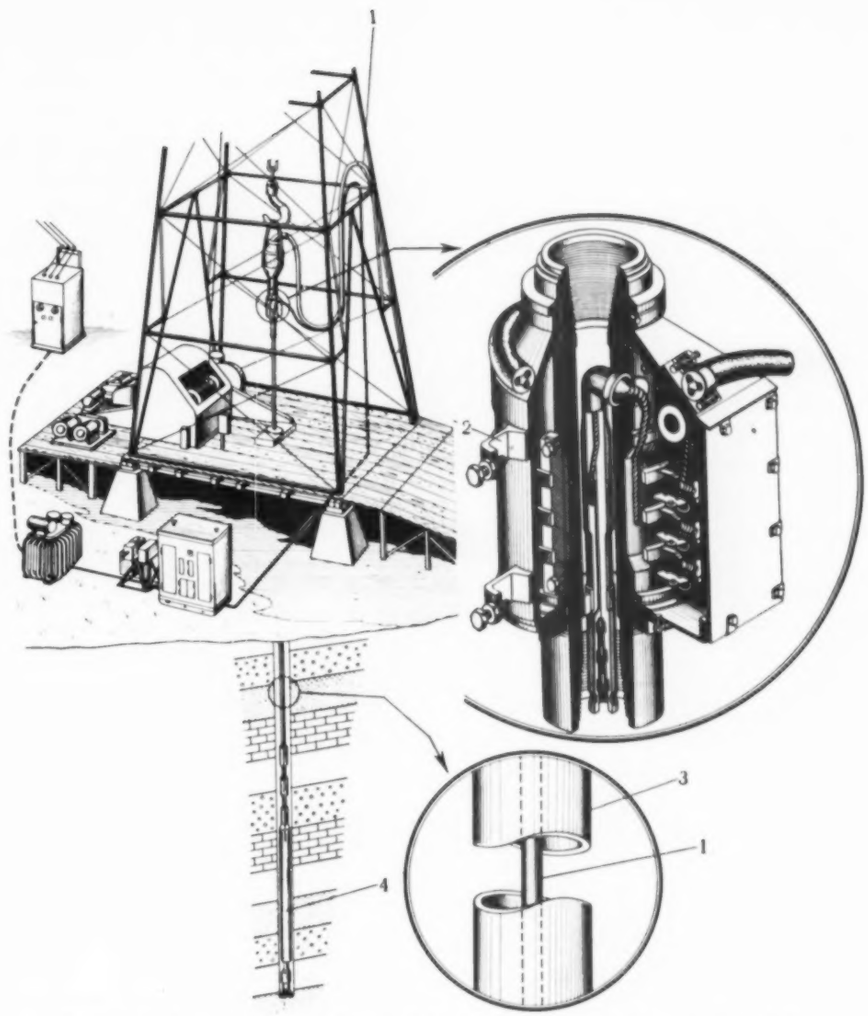

Fig. 4. Rig Layout for Electrodrilling. 1) Cable. 2) Collector. 3) Drill Pipe. 4) Electrodrill.

Depending on the difficulties encountered in deep well drilling under different geological conditions, the electrodrill permits using weighted drilling muds, aerated fluids, air or natural gas, and reverse circulation.

TABLE I

ELECTRODRILL CHARACTERISTICS

Type	Diameter mm.	Power kw.	Bit RPM	Permissible weight-on-bit "t"	Minimum Bit Size, mm.
e 250/6	250	280	920	35	295
e 250/8	250	230	680	35	295
e 250/10	250	150	530	35	295
e 215/6	215	200	920	25	243
e 215/8	215	150	680	25	243
e 215/10	215	120	530	25	243
e 170/6	170	100	920	15	190

The trend toward slim hole drilling necessitates the development of small diameter (127 and 170 mm) bottom-hole electric drives with high energy parameters. The problem of power supply through small size drill pipes (3½" and 4½") must also be solved.

The following new electromotors for electrodrills with a higher specific power and torque have been designed: a) a three-phase motor with a rotating outer housing, and, b) a low-voltage three-phase alternating-current motor of conventional type with one conductor in the slot or with a rotating outer housing and a phase and voltage transformer connected above the electrodrill. The latter type of electrodrill is fed through a single-wire power supply cable.

Pipeless Electrodrill: The main advantages of drilling with a pipeless electrodrill are light weight and portability of the drilling unit and a sharp decrease in the time spent on round-trips and other auxiliary operations. This electrodrill permits use regardless of the fluid level in the well. Local drilling fluid circulation is effected by means of a centrifugal pump mounted on the shaft of the submersible electromotor. Cuttings are gathered inside the bottom-hole unit and periodically lifted to the surface. The reaction torque on the bit of the early models of the electrodrills was relieved due

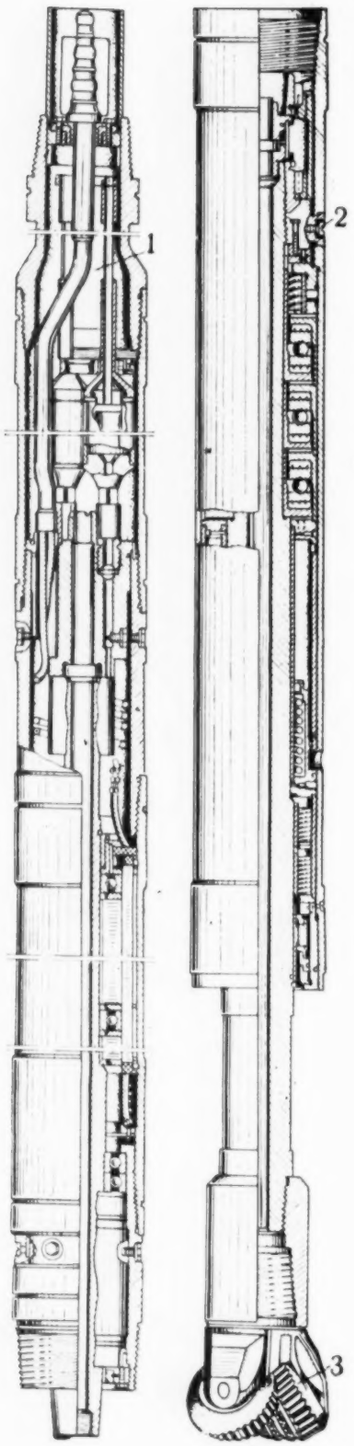

Fig. 5. Electrodrill. 1) Electromotor. 2) Spindle. 3) Bit.

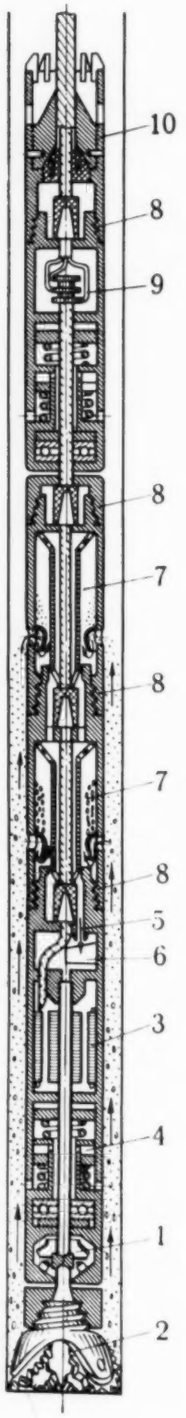

Fig. 6. Rig Layout for Drilling with Electrodrill Designed for 2000 RPM Bit. 1.—Mud Pump. 2.—Three-cone Bit. 3.—Electromotor. 4.—Protecting Oil Compensator. 5.—Nozzle. 6.—Nozzle relay for Circulation Control. 7.—Cutting Trap Bailers. 8.—Connecting Threads. 9.—Electric Swivel. 10.—Cable Wire-Line Connection.

to the inertia of the drilling unit housing which rotated alternately in both directions when reversing the submersible electromotor. Several wells were drilled with such a unit. The average penetration rate at bit RPM approximately equaled 600 and weight on bit varying in the range of 1.5-2.5 tons in hard and cherty formations was 1.7-3.5 m/hr. Time distribution in drilling with pipeless electrodrills (rotation constituted 40-50% of the time, round-trips amounting to about 6% of the time) permits obtaining a drilling rate per month of 500-600 m. per rig.

Three-cone bit tests at low weights-on-bit and speed up to 5,000 resulted in the development of a high-rpm pipeless electrodrill. This electrodrill can drill at high penetration rates.

The reaction torque of the bit used with this electrodrill is relieved due to friction forces arising between the electrodrill housing, the walls of the hole, and the fluid while the housing rotates in the opposite direction at 300-600 rpm. The cuttings are trapped by means of the centrifugal method which has replaced the nozzle method used formerly with the reversible electrodrill.

Experimental models of such electrodrills with 5¾" three-cone bits and 50 kw. electromotors were tested at depths up to 2,000 m. at bit weights in the range of 0.6-0.8 ton. The penetration rate with these electrodrills increased 2-2½ times as compared with that achieved with reversible electrodrills.

The pipeless electrodrill can be efficiently used in: a) drilling deep intervals, b) drilling low-pressure pay zones, and c) drilling out cement, deepening of the hole and other remedial operations.

Explosion Drilling: To increase penetration in deep wells or deep hard rock intervals, a continuously controlled explosion drilling process has been developed which eliminates the use of mechanical rock-crushing tools.

The method consists in the destruction of hard rock to make a hole by means of underwater blasting of special explosive charges. The charges are run at a predetermined rate into the drill pipe by the flow of the drilling fluid. They explode at the same rate on the bottom of the hole.

A sphere of destruction is formed in the rock adjacent to the bottom of the hole due to the underwater explosion. The sphere may be schematically subdivided into three basic zones differing in the intensity of the explosion wave action and in the degree of rock destruction.

Fig. 7 shows these zones after two successive explosions, designated 1 and 2. The destruction of the rock within the zones of crushing (A_1A_2) and predestruction (B_1B_2) is the result of the mechanical action of compression and tensile forces originating in the massif due to the immediate delivery of the compressed gas energy to the rock.

Fracturing in the zone of hydraulic action (C C) results mainly from repeatedly arising alternating strains caused by shock waves propagating in the fluid at the time of the explosion. The repeated action of the explosion results in separating relatively

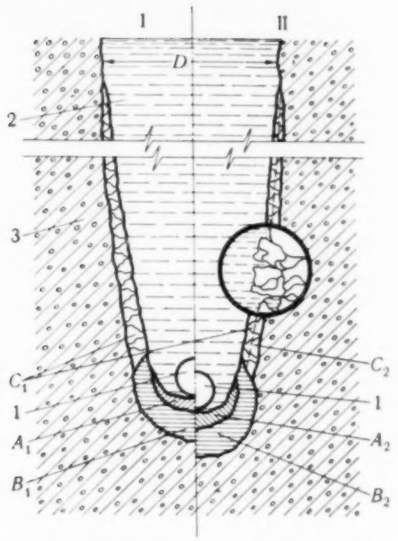

Fig. 7. Schematic Drawing of the Zones Resulting from the Action of Successive Explosions on the Rock. I) First Explosion. II) Second Explosion. A_1 and A_2—Zones of Crushing after First and Second Explosion, Respectively. B_1 and B_2—Zones of Predestruction. C_1 and C_2—Zones of Hydraulic Action. D) Obtained Hole Diameter. 1) Charge. 2) Fluid. 3) Rock Massif.

large fragments from the rock massif. The size of these fragments is large enough for use as rock samples.

The forming of the hole is the result of the combined action of repeated underwater explosions. Drilling progress is principally connected with the brisant action of the charge in the zone of crushing, the diameter of the hole being dependent on the rock breakdown in the zone of hydraulic action.

The possibility of drilling holes by means of explosions has been proved in field tests at depths up to 2,800 m. The maximum continuous well interval drilled by explosions in hard formations is equal to about 300 m.

The maximum rate of penetration achieved by explosions in hard limestones and dolomites was 16 m/hr., the average rate being 3-5 m/hr. The penetration rate depends on the depth of the well and the characteristics of the formations drilled. The diameter of a hole made by explosions does not depend materially on the diameter of the pipes used. This makes it possible to isolate zones causing difficulties by intermediate casing and to obtain an open hole of required diameter.

Thus favorable conditions may be provided for penetration of deep intervals using conventional muds, water, and even air. It should be noted that a hole of the minimum size permitted by diameter requirements for production (for example 6 inches and less), may be made by explosion drilling.

Vibration Method: When the vibration method of drilling is used the destruction of the rock is achieved by means of frequent impulses of force transmitted to the rock through the bit cutters provided with blades, teeth, or inserts. These impulses are usually within a low frequency range.

Tests under laboratory conditions prove that a combination of rotary drilling and sufficiently intensive vibrations or frequent thrusts results in an increase of the penetration rate and meterage per bit (the latter is especially important). This may be explained by the fact that the destruction of a formation is effected due to stronger forces without intensive sliding of the bit on the bottom-hole.

If cone bits are used the abrasive wear of the cone bearing is also reduced as the bit rotates at low rpm when the cone bearings are unloaded or the cones raised above the bottom hole.

The first experimental bottom-hole vibration-powered drills are designed as hydraulic ones for drilling 5¾" and 11¾" holes. They are mounted in place of turbodrills and the rotation of the bit at low speed is effected by means of a rotor from the surface.

In one of the vibration drill models tested under field conditions the bit is subjected to impacts of a heavy rod-valve continuously vibrated by the drilling fluid.

The tests revealed the necessity of installing, above the vibrator, a special damper, protecting drill pipes from unwanted vibrations.

Field tests proved the expediency of vibration drilling even with cone-bits. In many cases meterage per bit up to 150 m. was obtained in lime rock, the penetration rate being about 15 m/hr.

To ensure full scale application of vibration drilling in the industry it is necessary to improve designs of bottom-hole vibration drills, to increase their power and to extend their life. Simple monolithic bits should be used in vibration drilling instead of cone-bits. Such monolithic bits are being tested under laboratory conditions. They provide high penetration rates exceeding those achieved with cone-bits. For example the penetration rate in hard granite is equal to 20 m/hr. The use of simplified monolithic bits under field conditions will result in higher drilling progress especially in slim-hole drilling where the life of cone-bits is not long enough.

Electric Discharges in a Liquid Medium: The method of rock destruction by means of electric discharges in a liquid medium is based on an effect (similar to an explosion) which takes place when the space filled with the liquid between the electrodes is broken through by a high voltage discharge.

This complex phenomenon consists of electrical effects resulting from energy release in the discharge channel, and mechanical effects due to the generation and propagation of shock waves in the liquid and their action on the solid body.

An experimental model of the tangential drill is shown in Fig. 8. This drill consists of four positive electrodes mounted in the drill housing whose lower part has cuts forming four negative electrodes. There are air gap balls at the upper ends of the electrodes. A discharge ball placed above them rotates around the drill axis approaching in turn the lower discharge balls and successively forming spark gaps with each of these balls.

Laboratory tests of the tangential drill in numerous blocks of different rocks showed that the spudding-in of the hole begins with forming an annular groove. With a further deepening of the groove the core formed in the middle of the block is easily destroyed and therefore the bottom of the hole has a flat surface.

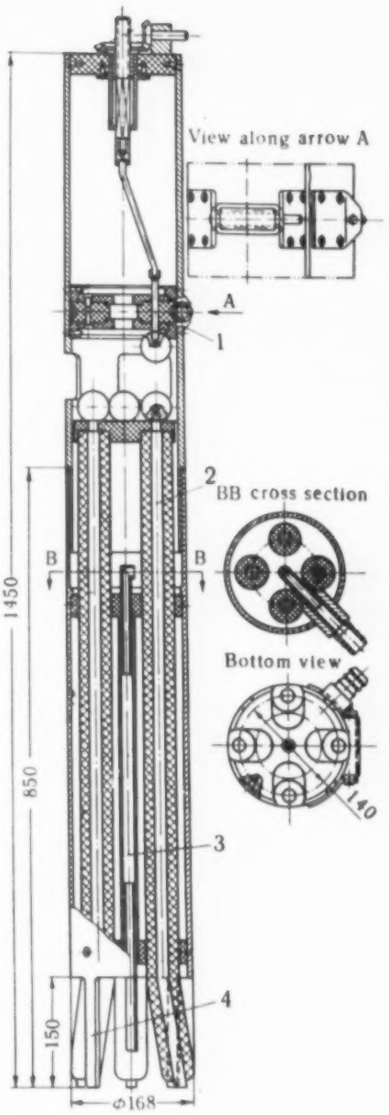

Fig. 8. Tangential Drill. 1) Mechanism for Rotating Upper Ball. 2) Positive Electrodes. 3) Pipe for Supplying Liquid to Bottom of Hole. 4) Negative Electrodes.

When using a tangential drill about 170 mm in diameter the hole size was 220-250 mm. Penetration rate at power consumption about 6-7 kw was equal to 0.5 cm/min. Power consumption per one discharge was about 100 kgm while energy release from the condenser was equal to 32 kgm. Thus the efficiency of the unit did not exceed 30%. However, specific energy capacity of the dolomite destruction process was 150-500 kgm/cc in spite of the low efficiency of the drill. END

Features of drilling contracts outside North America

by Th. J. Vrins*

Because of the special circumstances involved in drilling wells in remote areas in foreign countries it becomes necessary to add major provisions in agreements with contractors. Duration of contract, investment, rights to purchase equipment, auxiliary services, currency risks—all are discussed in this World Petroleum Congress paper.

For drilling a test well or a series of wells, operating companies outside North America nowadays have to face total daily drilling costs varying between, say, $3,500 and $12,000, depending on the location, the target depth, and the subsurface formations encountered.

In view of these costs, which are, especially in remote areas, substantial, the operator should specify his drilling program in detail, and should carefully select the drilling contractor who can be expected to carry out this program most efficiently.

In foreign countries such a contractor may be far away from his normal sources of supply, in places where adequate workshop facilities for overhaul or maintenance of and repairs to his equipment are often not available.

Many other services, usually "on call" in North America, may also be absent, such as:

a. "Special Drilling Services," required for the purpose of derrick erection, rigging up or down, cementing, testing, fishing, directional drilling, etc., and

b. "Auxiliary Services" required for instance for road and site preparation, housing and messing facilities, local transport, water supply, etc.

As these services are necessary in order to have contractor's drilling operations and program performed to the operator's satisfaction, special provisions, at present not required in North American contracts should be made to cover a number of operational items. It has therefore been found that, in order to ensure smooth and continuous operations, the contractor selected by the operator must have a clear drilling contract, in which these special provisions, and the relevant obligations and liabilities of both parties, are defined. Such a contract, properly understood by both parties before the start of a drilling campaign, forms the basis for continuous and successful operations.

In this paper some operational items are discussed which generally make it necessary for a number of provisions to be made, in drilling agreements relating to areas outside the U.S.A. or Canada. These are required in order to cope with certain aspects and conditions overseas, which usually do not exist in North America, or occur there in another form.

It is assumed that the drilling contractor concerned is operating with his own equipment, although many points raised are also applicable to contractors operating under a labor agreement only.

Duration of Contract. In view of the contractor's sizable capital investment and the operator's substantial costs for overseas transport of the drilling equipment, the provisions in the overseas contract should serve for a minimum number of operating years—say, two years, starting from the day of arrival of equipment in the area of operations—or for a minimum number of specified wells or footage to be drilled. In this connection certain costs which may be incurred by the contractor such as expenses for procuring and purchasing equipment specially ordered at the operator's request and expenses for hiring of personnel, accommodation, travelling, and turnover, have to be prorated over this minimum guaranteed contract period. It may be noted that up to now in agreements overseas, the drilling contractor's total transport costs for his equipment, materials, spares and consumables to the country of operations usually constitute reimbursable costs. On the other

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hand, return transport costs for these items are, unless the area is close to the country of contractor's origin (such as the Caribbean for North American Contractors), not likely ever to be included in the daily payment rate. This is in view of unforeseen future fluctuations of the freight market, which are difficult to allow for, and also since the eventual duration of the contract and the final destination of the contractor's equipment are usually not known.

For the sake of operational flexibility necessitated by the uncertainty of the drilling program, or to cover the event of an unsatisfactory performance by the contractor, the operator must be able, without having to specify his reasons, to cancel the agreement, with due notice, within the contract period or before the contractor has drilled the contractual footage. In a case of this kind the contractor should be paid an adequate "cancellation fee" to indemnify him for the prorated cost items just mentioned, as these are then not completely covered, and for personnel releasing costs incurred by the contractor because of possible lay-offs before expiry of his employees' contract terms.

On the other hand, the contractor may, with due notice, only cancel the agreement after expiry of the initial contract period. This stipulation is made in view of:

The required continuity of the operator's program, and the operator's often high initial termination costs under the contract, such as:

a. "Costs for mock rig-up." This item is sometimes required by the operator for unitizing and completing contractor's equipment to satisfaction in the country of origin, especially if new equipment is involved for the venture. Mock rig-up might be important in view of remoteness of the contractor's operational area and is often advisable if the contractor is a newcomer to overseas drilling operations.

b. "Transport costs" by sea and in the country of operation, incurred before the start of operations and after expiry of the agreement (including all payments to third parties for assembling and packing in the U.S.A., but not, of course, the costs for the contractor's own organization which the contractor includes in his home office overheads an recovers through the contract payment rates) including relevant insurances and sometimes duties. These costs may amount to 40 per cent of the original value of the equipment involved.

c. "Transit costs" representing capital interest from, say, 5 to 7% of the original value of the equipment in transit over a total period of sometimes four months. This item may also include the preliminary costs in the country of operation before arrival of the equipment and crews (in general it is customary in the drilling contract business not to charge equipment depreciation during the transit period).

Specification of Contractor's Services and Amount of Drilling Investment. For drilling in areas a long way from normal sources of supplies and mostly lacking adequate facilities for overhaul, maintenance and repairs, contractors will generally have to supply considerably more equipment, perform more services and keep a substantially larger stock of spares than are normally required for their North American operations.

The omission of items of equipment or services required by local conditions unfamiliar to the contractor could result in serious breakdowns or delays that might hurt the operating company more than the contractor. In order to prevent such omissions, and to avoid future misunderstandings as to whose responsibility it is to supply a certain item or perform an essential service, and also as a provision necessary for the evaluation of the contractor's drilling investment, it has been found of great assistance to both parties to have included in the contract a comprehensive check list specifying all equipment, materials and services, as well as the personnel required to fulfil the agreement.

It is therefore advisable that the operator, in his invitation for bids, should provide a number of selected and interested drilling contractors with such a list of specified drilling and special equipment; materials; stores facilities and other auxiliary services (such as medical service); expatriate personnel and some general indications of the way they will be accommodated, etc., which are to be furnished by the contractor and which the operator considers, in the first instance, suitable for the overseas operations. The special drilling equipment mentioned may include, depending on local conditions, all equipment required for special drilling services such as rigging up and down, cementing, testing, fishing and/or directional drilling, etc. In that event the expatriate drilling personnel furnished by the contractor should be qualified to render these services.

Basing themselves on the above list, the contractors are in a position to make a provisional estimate of the costs in their home offices. They do not need to visit the contract area before submitting their tenders, since this list excludes all items and services dependent on local conditions, such as all costs for local labour and expenditure on expatriate personnel's catering. This enables the contractors to quote a provisional daywork payment rate for the drilling operations contemplated.

On the basis of the quotations received, the operator selects the contractor, who is normally invited to visit the country of his future operations at an early date, in order to acquaint himself, as far as necessary, with local living and working conditions and to examine with the operator on the spot whether he will also be responsible for certain auxiliary services. The contractor may then suggest, before the contract is finalized, minor adjustments in drilling equipment, materials, accommodation and/or personnel which, in his experience, are better suited to local conditions and any additional items which he deems necessary for the auxiliary services which will be discussed in a later section. Costs for any such adjustments and additions, including expenses for any alteration or addition made at the operator's subsequent request because of changes in the operator's exploration or development programs after the date of invitation, and the costs which duly allow for the local cost items, now included, are all incorporated in the revised payment rate. The final daywork payment rate for the drilling operations will, therefore, be based on the final drilling investment and the actual local conditions involved.

The operator may sometimes request the insertion of an "Operator's Purchase Option" clause in the overseas contract. This is in view, firstly, of the "initial termination costs," already referred to, which are usually all to be paid by the operator as a reimbursable item.

Secondly, the clause may be requested in connection with a guarantee sometimes required from the operator to indemnify the contractor for those damages to and/or losses of his equipment which might be caused in the country concerned by certain cases of "force majeure" so far not coverable on the market under the "normal insurance policies" (this will be discussed in a later section in connection with "Contractor's Risks in Overseas Drilling Ventures").

Such a clause will stipulate that after a reasonable period of, say, four months, the operator has the right at any time to exercise an option to buy the contractor's equipment and materials with all their appurtenances, against payment of the relevant original prices minus appropriate depreciation. If the operator avails himself of this right, a reasonable specified amount in respect of the relevant spares and surface and subsurface drilling consumables at replacement values in the country of origin should be included in this purchase.

This purchase option clause enables the operator to exercise the option for instance:

a. if the contractor cancels the agreement, after expiry of the contract period, at a time inconvenient to the operator, or

b. if the operator is dissatisfied, for any reason whatsoever, with the contractor's performance (naturally, after contractor has been given a fair chance to adapt himself to the local working conditions, which do in fact sometimes differ substantially from those of the contractor's operations at home).

If the operator should exercise this option during the initial contract period, in all fairness to the contractor, a compensation in addition to the "Cancellation Fee" as mentioned in the section on "Duration of the Overseas Contracts," is sometimes negotiated as indemnity for the unexpected loss of investment as a source of profit, or the contractor's equipment and materials may be purchased at the "depreciated values" plus a fixed percentage of, say, 10% of these values.

As the operations of the operating companies have to be kept flexible, the operator may wish to insert in the contract the possibility of excercising the option to purchase the rig. However, it should be observed, here again in fairness to the contractor, that it should generally be impossible to purchase the rig in order to replace equipment

owned and used by the operator (or by third parties) in same country.

During the actual "contract drilling time" (i.e. from spudding the well to its completion) exploration and often even appraisal drilling agreements outside the U.S.A. are generally based on a "daywork rate" (or "D.R."). This contains, apart from all actual daily operating costs, such as depreciation, capital financing and home office overheads, a fair profit, which is either a percentage of the contractor's overall operating costs or is based on a percentage of the contractor's capital investment.

Although such is not yet a generally accepted feature, it would be advantageous to both parties to insert an incentive in the contract payments, so as to give contractor a healthy interest in a better or faster performance.

As incentive, for instance, the following payment rates may be inserted:

a. a "Modified Daywork Rate" to be paid during the contract drilling time for all "drilling operations proper" or "making-hole" operations. The "Modified Daywork Rate" includes, besides a basic payment (or "B.P."), a footage bonus (or "F") for each foot drilled to the operator's satisfaction while this modified daywork rate applies.

b. a "Standby" or "Shut-down Rate" (or S.R.) to be paid for all operations overseas outside the contract drilling time, such as moving of drilling equipment, including initial and final move from dockside and back, and rigging up and down. This standby rate, which is lower than the daywork rate previously referred to, represents contractor's actual costs during such non-drilling operations. These include—for these remote operations which are often performed under rough conditions—depreciation (for surface equipment only) and costs of financing, and, if the equipment is transported by the contractor, a reduced profit element as an incentive to induce contractor to cut down time on non-drilling operations.

Such agreements with incentive payments should contain a detailed check list or payment schedule for all types of drilling operations—again to prevent misunderstandings. This schedule will, for instance, indicate that "drilling operations proper" include not only the operations with bit on bottom, but also the accessory round trips for the purpose of bit changing, all reaming, cleaning and re-drilling of the hole for running instruments or castings, and all regular maintenance of the drilling equipment, if applicable.

In the case of incentive agreements like this, the invitation to tender should contain a prognosis of the drillability of the formations to be expected. The contractor, from a comparison with similar formations encountered elsewhere, will then be able to compute the penetration rate (or "P.R.") which on the basis of the operator's data, he may at least expect to achieve while working on the modified daywork rate. The contractor's quotation of a certain footage bonus F represents for him the additional profit for each foot of hole drilled in excess of this P.R. performance. The basic payment B.P. of the modified daywork rate can be derived as follows:

$$B.P. = D.R. - (F \times P.R.)$$

With regard to the incentive rates it is noted that:

1. If the contractor has quoted a high footage bonus F, a P.R. fixed relatively high may unreasonably increase his risk and is only feasible in a fairly well-known area. On the other hand, if such an agreement has a high footage-bonus quotation, a relatively low or "safe" P.R. may eventually result in unreasonably high profits for the contractor.

2. If no prognosis of the formations to be expected can be prepared by the operator's geologist, it will be preferable to keep the agreement based on a continuous daywork rate rather than to have the incentive character of the modified daywork payment agreement diluted by the insertion of a protective clause which guarantees the contractor a minimum payment at the daywork rate, either per day, per week or over the entire well. Under such an incentive contract with guarantee he would while on the incentive rate be paid extra for being able to work fast, and compensated for working slowly.

This guarantee would ensure that contractor would still earn the profit contained in the D.R. payment, during such time as his actual daily, weekly or well performance for certain intervals or in some areas fell below the relevant P.R. on which his rates were based, whereas the operator would continue to pay contractor's footage bonus for those intervals in which he exceeded this P.R.

Often below a certain depth, especially in unexplored areas, no valuable information regarding the drillability of the formation can be gained, so that below that depth the contractor has to work on the daywork rate.

3. As, in the course of exploration drilling the contractor obtains a better knowledge of working conditions and formations encountered, it should be possible for him to quote a more competitive F and B.P. based on a more appropriately evaluated P.R. However, even in such better-known exploration areas, contractors engaged in overseas operations are sometimes not inclined to reduce the B.P. below a certain minimum, in order to limit their risks. This minimum may be, for instance, the costs of depreciation and financing of their equipment. Together with a penetration rate known from experience the footage bonus is therefore limited to an amount acceptable to the operator.

In development areas the B.P. may eventually be reduced to zero. In such a case the contractor drills on a "footage contract" comparable in a way to normal footage agreements in the U.S.A. For a specified well programme certain items hitherto normally furnished in overseas ventures by the operator at his cost, such as bits, mud additives and auxiliary cementing and testing equipment, may now be incorporated in the agreement as contractor's responsibility. If they are furnished by the contractor at his cost, these items represent for him, though, an additional element of risk which might tend to make him unduly increase the footage rate.

However, as drilling-in of the pay zone and completion operations should normally remain the operator's responsibility, and in view of the operator's interest in a 100% well completion, the mud program and chemicals required below a certain depth or after cementing of the oil string, if set above the pay, should generally be furnished by the operator at his cost and not be included in the payment rates.

It is further noted that since tabulars and cement, purchased for a certain one or two year program, represent a high capital investment, they normally remain under the operator's responsibility, although occasionally, if the operator has no organization whatsoever, he may request the contractor to procure these items at a certain fee.

4. Under this type of incentive agreement, time consumed for some operations of differing natures, should preferably be paid for at one and the same rate. This limits, for the sake of clarity, the number of payment rates and also balances contractor's risks by having a somewhat higher payment for certain operations and a lower payment for other operations. For instance, the said "standy rate" could be paid for operational periods such as:

a. "Time spent in fishing," after the first 24 hours: Such periods might be substantial in remote operations and unreasonably increase the contractor's work if he were to continue to operate on a modified daywork rate at the low basic payment, whereas on the other hand, according to this "standby rate," contractor will receive a reduced fee, during prolonged fishing whilst working on the daywork rate;

b. "Time spent in often lengthy production tests"—for example if they exceed 48 hours per well; and

c. "Time spent in waiting for the operator."

Payments for time consumed for these reasons should be in line with the actual costs incurred by a contractor with his equipment idling. It is thought better not to introduce another higher standby rate which includes the normal profit for operational periods such as the last two types, since periods of the first type could usually have been paid for at the basic modified daywork rate, which is sometimes much lower.

Division of Risks. 1. The provisions regarding the risks involved in drilling operations outside North America do not appear to deviate much from those usually contained in North American drilling agreements.

The contractor can find coverage on the overseas insurance markets, under an adequate comprehensive policy, for the majority of the risks on property and for legal liability (including that arising from automobiles). In view of the substantial investment involved, it has become customary for the contractors to take out for their operations overseas as comprehensive an insur-

ance as possible, which gives the operating companies a certain guarantee that, in the event of an accident, the contractor will be able to fulfil his contract as far as financial strength is concerned. Therefore, and also to prevent any superfluous or inadequate coverage in view of insurance arrangements already made by the operator, operating companies generally wish to examine and approve the insurance policies of their drilling contractors.

In the second half of 1958, for land-based drilling operations, the premium rate for such comprehensive insurance during the operational period amounted to about ¾% to 1½% per annum of the insured value of the drilling equipment, with a franchise of, say, $2,500 US per accident, and may range up to 5% per annum for marine drilling operations. Apart from the claim experience of the contractor concerned, the height of the premium rate will depend on the general position of the relevant insurance market, on the country involved and the amount the contractor is willing to take as own-risk in respect of each claim.

2. Usually excluded from the comprehensive policies for drilling operations are some risks relating to certain cases of "force majeure," such as:

a. Strikes, riots and civil commotion, although coverage against these risks can be found on the insurance markets for operations in certain countries.

b. Currency inconvertibility, confiscation and/or expropriation, prohibition of repatriating assets, although losses of this kind can sometimes be partially or totally covered, for certain countries, by institutions such as the U.S. International Cooperation Administration, the British Overseas Investment Guarantee Trust, etc.

c. War and civil war, affecting land-based property and fixed drilling platforms.

All or part of these risks, which are beyond the contractor's control and are not covered by the usual insurance policies, may in exceptional cases be borne by the operating companies, depending on the circumstances and on other provisions in the contract.

3. The overseas drilling contractor, especially when operating under an incentive daywork contract as described before, may still have to face another risk: this is damage to or loss of his subsurface equipment while working at the modified daywork rate. This risk is partially not insurable under his policy.

The damage or loss, as will be defined, would generally only be recoverable from underwriters if of an accidental or unforeseeable nature (e.g. an accidental breakdown or fault in equipment, or failure of the human element, such as negligence of insured's personnel). That is to say that underwriters do not pay if the damage is caused by negligent performance on the part of the management of the contractor and they usually do not pay for damage which is inherent in the specific operation itself, such as that arising from normal wear and tear, or when it is due to something which could have been anticipated in the light of existing knowledge, such as striking an abnormally abrasive or a high-pressure formation while wildcatting.

It is reasonable that, in the case of explored, known areas, where such an incentive contract is applied in the first place, the contractor himself should generally bear these uninsurable risks in respect of his subsurface equipment, whereas, on the other hand, in unexplored areas, where knowledge of the subsurface is lacking, the operating company obviously has to meet the cost of damage to or loss of contractor's subsurface equipment resulting from such unknown conditions.

4. Normal business risks which contractors will always have to bear in all contracts, including overseas agreements, should be mentioned here, since such risks, which overseas are often greater than in the U.S.A. or Canada, may seriously impair the contractors' overseas operations. These risks include the risk of miscalculating the operating costs arising, for instance, from underestimated local conditions, such as abnormal wear and tear of the equipment, and lack of services or excessive personnel turnover caused by living conditions different from those prevailing in North America.

Special Provisions in Overseas Drilling Contracts are sometimes required after local investigation by both parties.

Auxiliary Services. Additional provisions have to be made for some or all of the auxiliary services, in order to make the drilling contractor responsible for carrying out, for instance, the necessary road and site preparation, for supplying housing and messing facilities, water and/or transport (although drilling contractors have in general only to cope with land transport, since major water and/or air moves mostly require the introduction of contractors specialized in this type of transport). These auxiliary services play an essential part in the entire operation. This holds good especially in the case of new overseas ventures in under-developed countries where these facilities are not readily available.

In this connection, in order to avoid program delays, it is expedient that, in his initial informative letter to ascertain whether the drilling contractor is interested in and willing to bid for the particular venture, the operator should point out that the drilling operations contemplated may eventually include certain auxiliary services, and that the contractor who tenders should therefore be prepared to provide and carry out all such services if requested by the operating company upon closer investigation.

For certain ventures the drilling contractor selected should therefore, apart from being prepared to invest the additional, often substantial, capital necessary for these services, be capable of attracting the special personnel qualified to supervise and operate satisfactorily such oil-field transport and road-building equipment as required in remote, foreign areas, where working conditions may be difficult, since specific labor or juridical problems are sometimes involved.

Drilling contractors who are not familiar with this sort of business should also realize that, apart from possible water-well drilling operations, such additional "package deals" in most cases actually entail smaller risks than those which they have to face in their normal drilling operations. This is the case even when operating on a daywork contract, provided of course that the relevant operating costs for these auxiliary services are properly allowed for, as previously pointed out.

In consequence the contractor in all fairness, will have to accept a smaller return on his additional investment than the return considered to be adequate on his drilling investment.

Allocation of Special Risks. Apart from the business risks already mentioned which are entirely for the contractor both in North America and overseas, certain items in the overseas agreements entail risks which may only be partially borne by the contractor. To cover these risks, special provisions may have to be inserted in the overseas contracts, partly in consequence of the rather prolonged duration of such contracts.

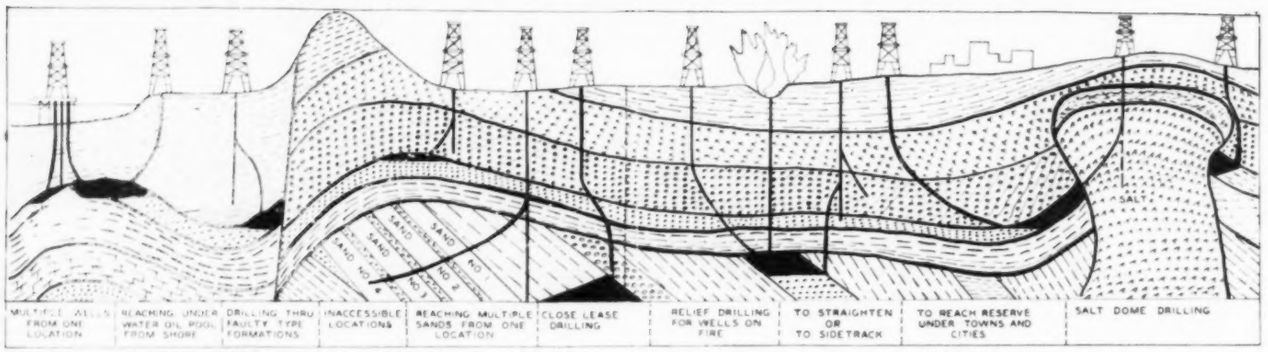
These special provisions might for instance relate to:

1. "Variation in rate of exchange," i.e.: if the rate of exchange of the local currency vis-a-vis U.S. currency (or any other currency in which contractor's payments are effected) varies by more than, say, 10% of the rate applicable at the date of commencement of the contract, the payment rate can be revised so as to take into account the real influence of such variation on the rate.

2. "Level of salaries and/or wages." If the salaries and/or wages of contractor's personnel vary by more than, say, 10% of the salaries and/or wages payable at the date of commencement of the contract, the payment rate can be adjusted in accordance with such variation.

3. "Negligent performance by contractor, including his personnel." This provision stipulates that, if overseas, just as in North America, the contractor or his personnel have not carried out the work designated under the agreement with reasonable care, the consequences of this unsatisfactory performance must be remedied to the satisfaction of the operator at a lower rate of payment.

General Remarks. It will be appreciated that this paper cannot cover all the problems which the drilling contractors, who intend to qualify for overseas work, nowadays have to face. For instance, government regulations in several countries outside North America, covering payments in foreign currencies, and the problems which these raise for both operator and contractor, have not been dealt with. A proper consideration of such matters, even if of a summary kind, would extend the length of the paper beyond due limits. No doubt, the contractors with the true spirit of the entrepreneur will take in their stride the present problems which have been discussed and any new ones arising in the future.


MULTIPLE WELLS FROM ONE LOCATION
REACHING UNDER WATER OIL POOL FROM SHORE
DRILLING THRU FAULTY TYPE FORMATIONS
INACCESSIBLE LOCATIONS
REACHING MULTIPLE SANDS FROM ONE LOCATION
CLOSE LEASE DRILLING
RELIEF DRILLING FOR WELLS ON FIRE
TO STRAIGHTEN OR TO SIDETRACK
TO REACH RESERVE UNDER TOWNS AND CITIES
SALT DOME DRILLING
SALT
SAND
SAND NO. 1
SAND NO. 2
SAND NO. 3

Applications of directional drilling.

Improvements in directional drilling technology reduce footage costs

by Linn H. Galeener

Offshore development has increased the economic importance of multiple well drilling from a single location adding impetus to the development of new tools to facilitate directional drilling by improving accuracy and reducing rig time.

LINN H. GALEENER, manager of directional drilling for Houston Oil Field Material Co., Inc., Houston, has been with HOMCO for 19 years. He has served in various capacities of the directional drilling department and has been connected with directional drilling for a quarter of a century.

THE inherent advantages of the modern-day science of controlled directional drilling are quite obvious when considered in the light of simple efficiency.

A lesser publicized fact is that this technology has caused impressive reductions to be made in the cost of drilling.

Statistics indicate that in the last quarter-century, such cost-determining factors as labor, materials and equipment have increased price-wise some 60 percent. However, the true picture only emerges when it is considered that 1959 total footage figures are 95 percent over that of two and a half decades ago. And, the inflationary trend certainly has to be considered.

Therefore, when drilling costs are measured in terms of constant dollars per foot drilled, reductions in drilling costs are truly an achievement of real dimension.

In measuring the contribution of improved directional drilling technology to the industry, and *after* cost per foot drilled trends have been adjusted for the effects of inflation and increased depth, a reduction in cost is indicated to be more than 25% only in the last decade.

On the same basis, it is conservatively

estimated a much greater reduction has been accomplished from costs of 25 years ago, possibly as much as 50%.

An outstanding factor contributing to this cost reduction is directional drilling. Some specific elements of this basic factor should be emphasized.

The first practices of directional drilling were comparatively crude and extremely expensive, consequently such methods were employed only as a last resort in drilling by or sidetracking obstructions in the bore hole. Actually directional was a misnomer as direction with respect to azimuth was of no consequence, merely a deflection from the vertical suffcient to bypass the obstruction, to permit further deepening of the hole.

The first large scale directional drilling operations were initiated at Signal Hill, California and nearby areas where wells were drilled from town lot surface locations. By this practice several wells could be drilled from one surface location to permit producing from a much larger subsurface area.

Subsequently, in the same general area, directional wells were drilled from shore locations to develop offshore reserves. Extreme angles from vertical were required to reach as far as 7,000' horizontally.

Today, directional drilling is a science and is defined as the controlled steering of the drill bit in a required direction to a given point below the surface of the ground.

Directional drilling *as an economic measure*, has three objectives: (1) the straightening of crooked holes, (2) sidetracking around lost tools or junk in the hole, (3) the drilling for a specific objective by maintaining the course of the hole so that it will bottom-up at a predetermined location. The latter purpose involves considerable skill on the part of the directional engineer and is undertaken principally to deflect a hole to the underside of a salt dome; to drill a relief well to cratered or burning wells; to drill through a multiplicity of sands from one location; to reach an under water oil pool from a rig located on land; to reach inaccessible locations; close lease line drilling; under-ground storage; drilling for sulfur; townsite drilling; defining Potash beds; and one of the most important, the drilling of a multiple of wells from a platform located offshore.

The latter of these has been widely used with the discovery of oil under the ocean. Oil companies have found that it is far more economical, in the long run, to drill a number of wells from one platform than to drill individual wells. This is due to the high cost of moving the rig and building the tremendous offshore platforms that are required. Oil companies have presented another fact which substantiates the use of directionally drilled wells offshore. This is, that they are looking toward the long range production from these wells and contend that it will prove to be more economical to maintain multiple wells from one location rather than from individual wells. Maintenance is reduced, travel time and equipment are kept to a minimum.

It is true, that in the early days directional drilling was time consuming and costly due to the "surface method" of orienting and the necessity of taking open hole surveys to determine the course of the well bore. Now, two developments have been introduced which reduce the cost (approximately 50%) of drilling directional wells. These are the direct and indirect method of bottom hole orientation and K-Monel (non-magnetic) drill collars.

The direct method of bottom hole orientation involves the use of a non-magnetic K-Monel Orienting Sub and a single shot magnetic surveying instrument. The position of the deflecting tool bottomed in the hole is determined from the single shot record which indicates the angle between magnetic north and the axis of the north magnet arranged in the non-magnet sub. In the direct method, it is not necessary to rely upon a preliminary open-hole survey.

The indirect method of bottom hole orientation requires the use of a full-gage orienting sub which is positioned in the drill string immediately above the deflecting tool. The tool is then run in the hole in the same manner as an ordinary bit.

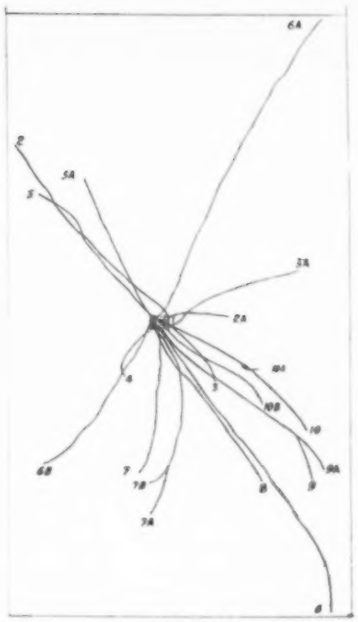
After the tool reaches bottom and circulation has been established, a special instrument is lowered through the drill stem and into the orienting sub. The instrument registers the relative position of the tool in the hole. It is then a simple matter to compare this reading with previously taken open-hole directional readings and rotate the tool in the desired deflecting position.

It should be noted that these methods require rig time, yet compared to the old methods, they reduce the cost of directional drilling considerably, and are still employed when necessary.

Further developments, which helped to reduce the cost of directional drilling were Fullgage Deflecting Bit (Spud Bit) and the Fullgage Universal Joint. They contribute much to time saving over a conventional whipstock, especially where hole conditions will not permit the running of a tool which cannot be washed to the bottom of the bore hole. The Fullgage Deflecting Bit employs the principle of the eccentric and when pointed in the desired direction drills a full-gage directional hole. Because this tool can be reset without removing pipe from the hole, as many feet of hole as desired may be drilled on one run of the bit. Blades are hard-faced and will drill many feet of full gage hole in soft to medium-hard formations.

With the bit pointed in the correct direction, it is spudded into the formation. In soft formations, the bit is then rotated slowly until it has made two or three complete revolutions, after which it may be rotated at speeds approaching those used with conventional bits in like formations.

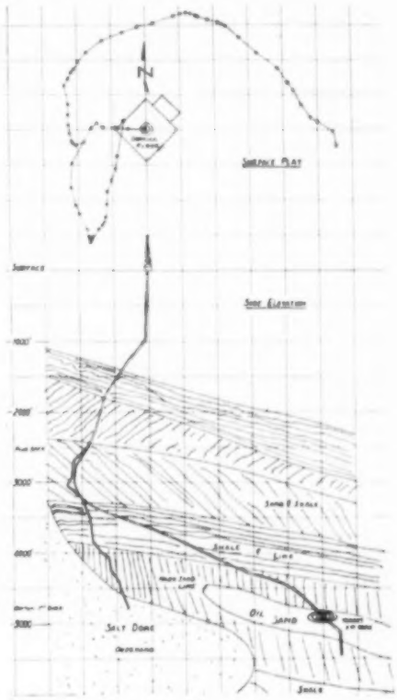
If the sub-surface formation is such that the Full Gage Deflecting Bit can be used in sidetracking or directional drilling, the coincident use of the non-magnetic orienting sub in the same string offers the operator a tremendous saving in time. The combination



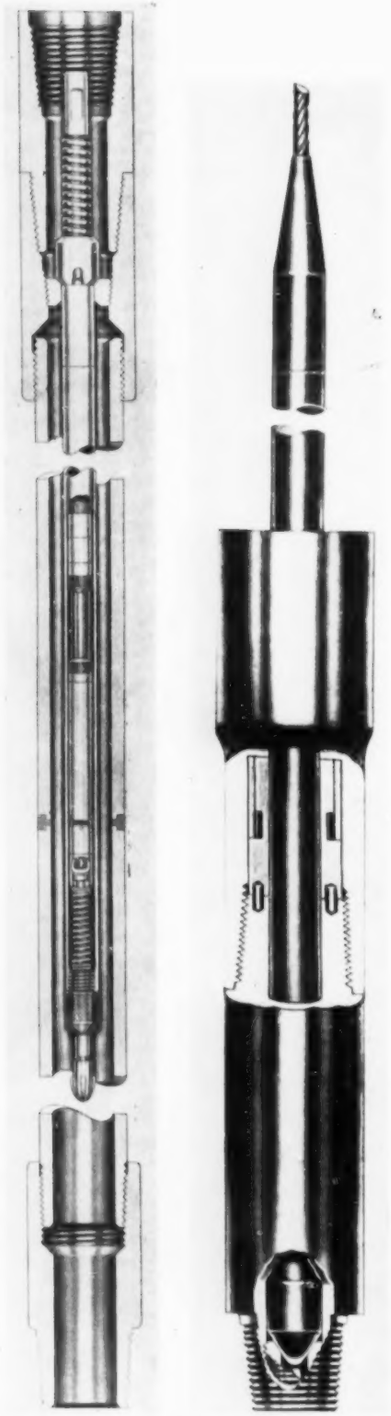
LEGEND

Well No.	Horizontal Displacement	Max. Angle	Avg. Angle
1	vertical		
2	1,600	23° 00'	16° 30'
2A	400	9° 00'	6° 30'
3	490	8° 30'	7° 00'
3A	1,000	17° 30'	14° 00'
4	470	10° 00'	6° 45'
5	1,267	31° 45'	25° 00'
5A	1,070	16° 00'	10° 15'
6	2,417	44° 00'	31° 00'
6A	2,412	30° 00'	23° 45'
6B	1,330	19° 00'	13° 45'
7	1,115	12° 30'	11° 45'
7A	1,340	17° 30'	13° 45'
7B	1,067	12° 00'	7° 30'
8	1,273	14° 30'	10° 30'
9	1,550	31° 00'	20° 45'
9A	1,607	23° 00'	10° 45'
10	1,160	17° 00'	12° 00'
10A	26	10° 00'	8° 00'
10B	809	11° 00'	8° 15'

Drilling nineteen holes from one location, 10 of them producers, thereby exploring an area one mile square on a 20-acre spacing basis, is by far the largest directional drilling operation ever attempted. Scene of the activity was the Creole Field in the Gulf of Mexico, off the Louisiana coast.



Plat of an actual Salt Dome Directional Drilling operation. Upper graph is surface plat while the lower graph is the side elevation.



Above left: Direct method of bottom orientation as described in the text. Instrument is shown inside K-Monel Collar.

Above right: Indirect method of bottom hole orientation. Photo is the Indirect Orienting Sub.

of the Fullgage Deflecting Bit and the direct non-magnetic method of orientation allows: (1) Continuous operation with constant sub-surface surveying check runs to determine the direction of the hole. As this particular directional drilling tool and non-magnetic sub permit as many tool settings and single-shot runs as may be required, there is no need of removing the operating pipe from the hole: (2) Where sand lines are not available, the use of the non-magnetic sub makes it possible to run the surveying instrument on a small line.

With the improvement of drilling fluids new type stabilizers and reamers are now being used for directional, as well as vertical drilling. These tools have reduced drilling costs by increasing the penetration rate; permitting increased weight on the drilling bit; relieving the danger of wall sticking; preventing dog-legs and key-seats; reducing friction on the drill collars and helping to keep the hole "to gauge."

Another development has been the "jet bit method" for offshore and other areas where softer formations are encountered and the bit can be directed on a given course with pump pressure. This is a recent development of the California Research Corporation. This method employs the use of a jet bit with one jet reduced in size to increase the jetting action of the drilling fluid as compared to other circulating jets in the bit. The higher velocity jet is oriented in much the same manner as the Eccentric Fullgage Spud Bit to initiate deflection of the hole from vertical in the desired direction with respect to azimuth. The jet bit method drills a full-gage hole and permits resetting, if necessary, or continuous drilling. Where formations permit, this method as with the Fullgage Eccentric Spud Bit, saves considerable rig time.

New tools which have been introduced recently are the HOMCO Mechanical Orienting Tool and the HOMCO Circulating and Releasing Whipstock.

The Mechanical Orienting Tool presents a new concept for orienting whipstocks and deflecting tools without the use of sub-surface surveying instruments, which previously required two or more trips with a wire line to correctly orient the deflecting tool. The drill pipe is raised, rotated and lowered until a ball (which always rolls to the low side of the hole) falls into a slot which permits the tool to close and indicates that the deflecting tool is correctly oriented. The advantages of this tool are: eliminates numerous trips into the hole with sub-surface surveying instruments and reduces orienting time from four or five hours to approximately twenty minutes. This is a great saving of rig time and reduces cost of directional drilling. Other advantages include (1) torque in the drill string does not affect the setting of the whipstock; (2) the tool is not affected by hole temperatures which may cause film failures in surveying instruments.

The Circulating and Releasing Whipstock is an improvement in solving a problem often encountered in most directional drilling operations. This problem is the removal of sediment and cuttings which settle to the bottom of the hole after circulation ceases. This fill prevents the whipstock from reaching and seating in the bottom of the hole. This tool permits sediment to be circulated out of the hole before setting, eliminating 'misruns' with the whipstock. The circulating fluid is channeled through the whipstock to the lowest point of the tool. While circulating, the whipstock can be rotated without danger of shearing pins, assuring a firm seat.

These two tools when used in conjunction are operated as follows: The whipstock is assembled in the conventional manner. The Mechanical Orienting Tool is installed in the drilling string one joint above the deflecting tool. The assembly is lowered through the rotary table until the top of the orienting tool is at a convenient height. The directional drilling engineer determines the direction that the deflecting tool must face to deviate the bore hole in the desired direction. The correct relationship between the orienting stem clockwise or counter-clockwise is established using a protractor stem. The orienting tool is raised until the hex drive sub is at a convenient height, then the swivel nut lock screw is tightened to insure that the relationship between the orienting stem and whipstock will not be altered prior to reaching bottom and while orienting.

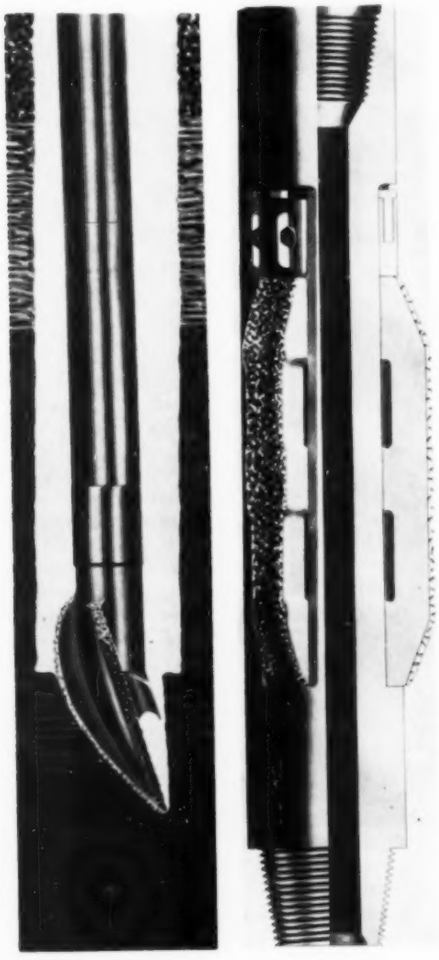
The string is lowered into the hole and normally the drilling fluid is circulated. However, circulation cannot be maintained during orientation. The drilling string is lowered to the bottom of the hole with a predetermined amount of weight and the kelly is marked. The drill string is raised and turned approximately 10 degrees. The string is then lowered back to the bottom of the hole and original weight indications checked and the marked kelly verified. This procedure is repeated until the long slot is located, at which time additional travel downwardly of approximately 28 inches will be noted on the kelly. This indicates to the directional drilling engineer that the whipstock is oriented in the desired direction. Orientation is checked by repeating this procedure. As previously stated, this operation can be accomplished in a matter of minutes.

In summarizing, it should be noted that directional drilling is a science and much praise should be given to the engineer whose job it is to drill more hole at the least possible cost. Mechanical ingenuity will continue to develop new tools and methods to meet the challenge of more efficient and economical directional drilling to serve the industry.

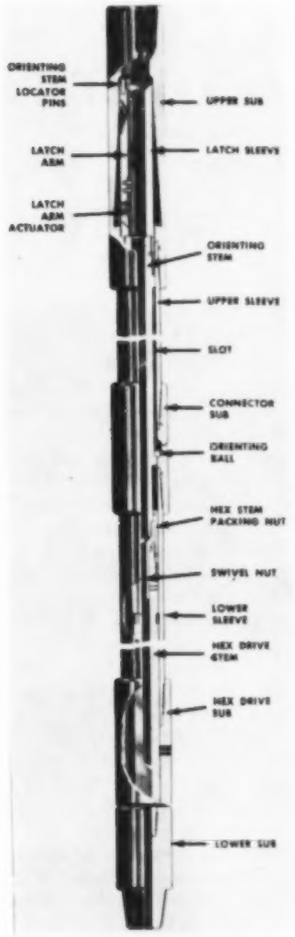
The use of Directional Drilling was used to help extinguish this costly offshore fire. Photo is the recent CATC fire in the Gulf of Mexico off the Louisiana Coast. Account of this fire was carried in oil publications throughout the U.S.A.

Below left: Fullgage Deflecting Bit. Because of eccentric action, bit drills a full-gage directional hole in direction pointed.

Below right: Replaceable Blade Stabilizer. Hard faced or Klustrite blades used as reaming edges and when tools are properly placed in the string, they stabilize the working string.



Mechanical Orienting Tool. Used to orient deflecting tools in a matter of minutes.



C & R W hipstock. Can be rotated and circulation maintained while lowering into the hole without fear of shearing and pre-setting the whipstock.

Specially constructed filling points for loading butane and propane at Coryton plant.

Mobil Oil Company's new LPGas recovery unit

by James McG. R. Clemie

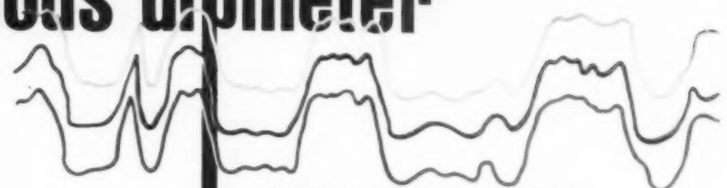
Supervisor of the Process Design Group, Coryton Refinery

In order to obtain greater realization from refinery tail gases, Mobil Oil Co. Ltd. has recently built an LPGas unit at Coryton refinery in Kent. This unit, designed by members of the Coryton process design group and engineered by Constructors John Brown, was commissioned in mid-February 1959. With the startup of this unit, propane and butanes previously burned as fuel gas in the refinery heaters are processed for sale and for use within the refinery as 99 mol. percent pure propane and 98 mol. percent pure iso-normal butane mixture. Furthermore, this unit will provide useful light off-gases for sale to the North Thames Gas Board and the purification unit for this gas sale was designed by the same Coryton group and engineered by the company's engineering group, completed at the beginning of July 1959.

Off-gases containing light hydrocarbons (methane through to pentane) from a crude unit stabilizer operating at 120 psig and 130°F are fed to the compressor suction knockout pot which is fitted with a level controller passing any condensate into the fuel gas main. This gas feed flow rate is controlled by means of a recording flow controller which is conditionally cascaded with a back pressure controller giving preferential control to the crude unit stabilizer pressure. The gas leaving the knock-out pot passes into a variable speed compressor; the speed of the compressor being regulated by a pressure controller on the knock-out pot. Leaving the compressor at 270 psig the gas joins the incoming feed gas from a platinum reformer stabilizer operating at 265 psig and 145°F.

The combined gas stream passes through the charge condenser, where it is cooled to 90°F; this temperature being maintained by hand control of the cooling water through the condenser. Most of the gas feed is condensed and passes into the first stage flash drum where, at 90°F and 255 psig, the uncondensed gas is taken overhead while the condensed liquid is pumped to the deethanizer. The level in the first stage flash drum is maintained by an averaging level

continuous dipmeter



Simultaneous recording of all data for

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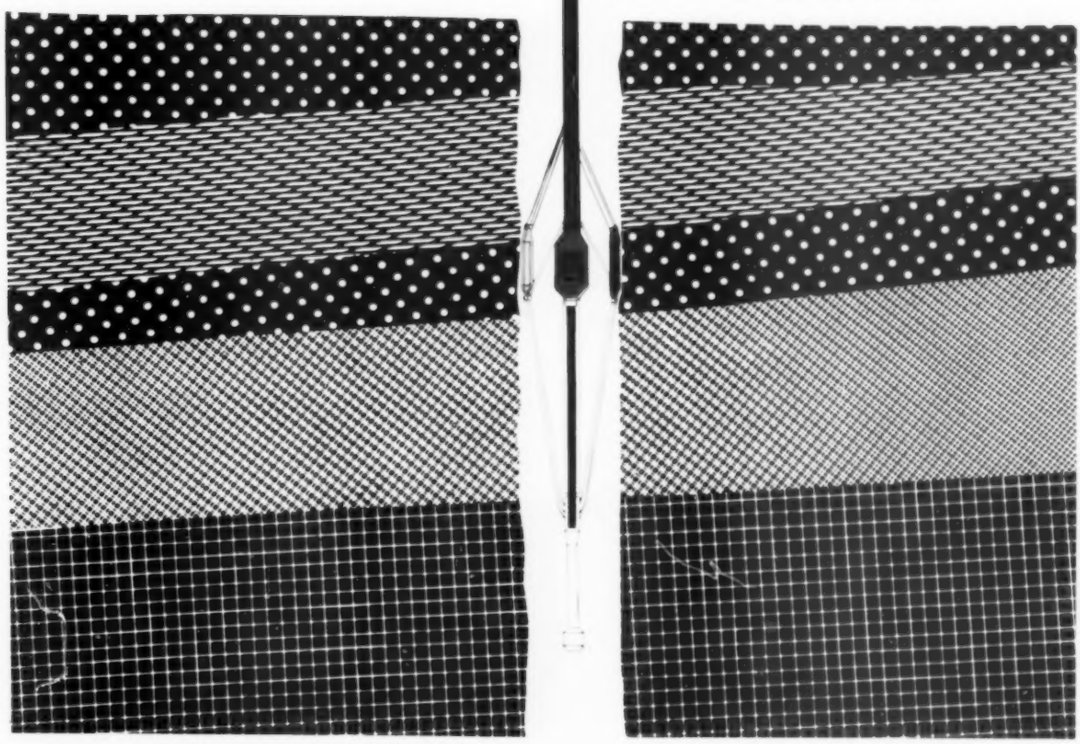
- formation dip orientation
- hole deviation
- hole size

SCHLUMBERGER



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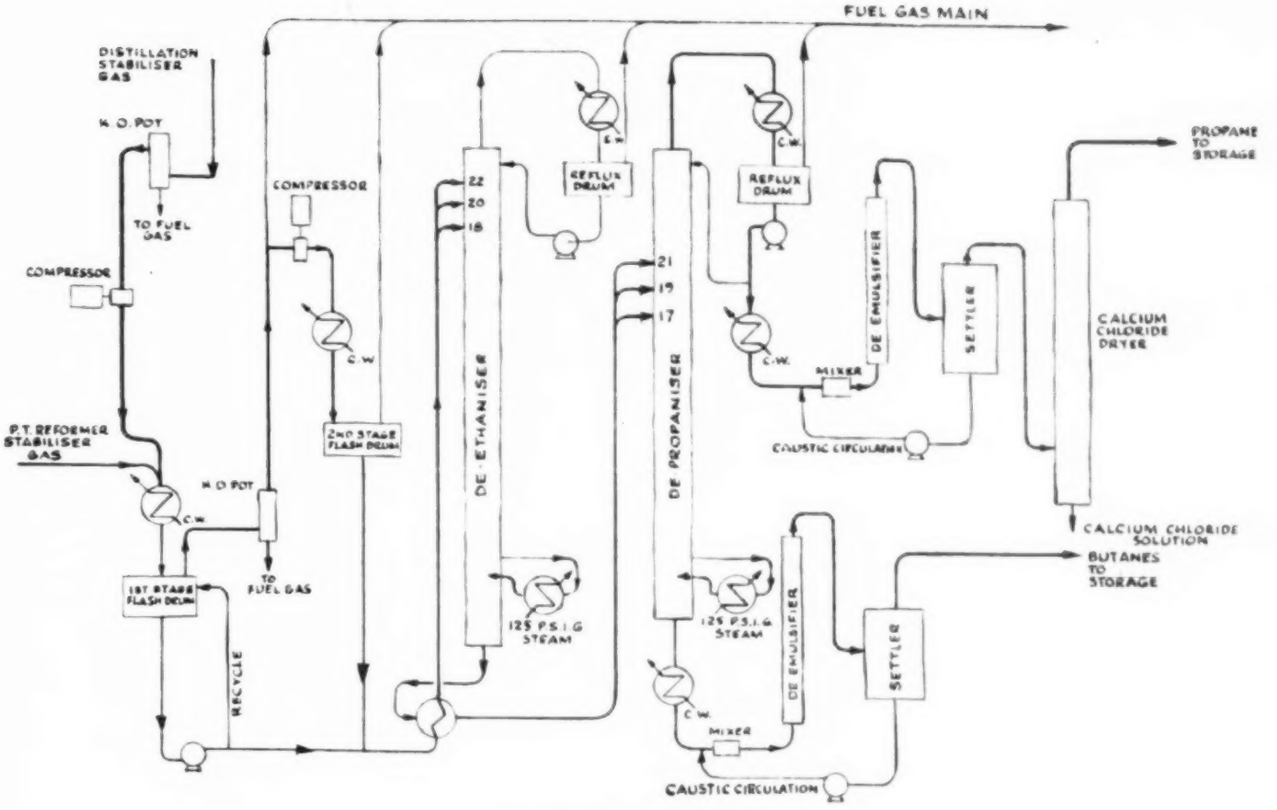

LPGas Unit Flow Diagram.

controller situated on the recycle line which resets the flow control valve controlling the feed to the de-ethanizer column from the first stage flash drum. This recycle system round the first stage flash drum permits wide variations in unit feed rates which would otherwise necessitate the installation of several different sized pumps.

The uncondensed gas which is flashed off the first stage flash drum passes overhead to the second compressor suction knock-out pot, where any liquid carryover is collected. This knock-out pot is held under level control—any condensate being bled into the fuel gas main. The gas leaving the top of the knock-out pot passes to the suction of the second variable speed compressor. Since the total off-gas from the platinum reformer stabilizer is fed to the LPGas unit the pressure on this stabilizer is controlled by the speed of the second compressor. Should conditions exist where the compressor is operating at maximum speed or the compressor be shut down then the excess or total gas will by-pass the compressor and enter the fuel gas main through a pressure controller.

The gas leaving the second compressor at 550 psig passes into the second compressor-after-condenser where it is cooled to 100°F —the temperature being controlled manually on the cooling water valve. The vapor liquid mixture passes to the second stage flash drum which is maintained at 500 psig and 100°F. The condensate, which is held under level control by means of an averaging level controller passes into the de-ethanizer feed line. The pressure in the second stage flash drum is controlled by means of a back pressure controller; the off gas passing into the fuel gas main.

The feed to the de-ethanizer, consisting of the combined stream from the two flash vessels is preheated by exchanging heat with the de-ethanizer bottoms in a heat exchanger. The de-ethanizer feed enters the tower on tray 18, 20 or 22, tray number 24 being the top tray. The type of trays in the de-ethanizer tower (likewise for the de-propanizer tower) are Socony Mobil Uniflux trays which are of S section construction and are considered much superior to the standard bubble cap type tray as well as being approximately 60% cheaper. The tower bottoms product composition consisting mainly of propane and butanes, is controlled by means of a Foxboro-Yoxall differential vapor pressure cell (d/vp cell) which enables a much more rigid temperature control to be obtained than possible with the normal conventional temperature controller. The d/vp cell actuates a flow control system on the steam to the reboiler —the bottoms temperature being 230°F. The maximum de-ethanizer tower pressure is 500 psig and is controlled by means of a narrow span pressure controller which allows uncondensed gas to pass from the de-ethanizer reflux drum to the refinery fuel gas main.

De-ethanizer overheads consisting of propane and lighter gases pass overhead at 135°F to the reflux condenser where they are cooled to 90°F and the heavier gases are condensed. Reflux consisting mainly of ethane and propane is returned to the top of the tower by the reflux pump to give a reflux ratio of 5 to 1; the reflux rate being controlled by a flow controller.

The level of liquid in the de-ethanizer reflux drum is controlled by means of a level controller which operates a control valve located on the cooling water outlet from the overhead condenser, thus bringing about the desired amount of condensation to maintain the liquid level in the reflux drum. Good control from such a system is dependent upon having fairly high water velocities at all times through the tubes of this condenser. Normally during the summer months the cooling water velocities through the condenser tubes will be reasonably high. However, because of lower cooling water inlet temperatures, the cooling water velocities during the winter months would be less than two feet per second which would lead to poor control. Consequently, this condenser (similarly the depropanizer overhead condenser) has been fitted with an external piping arrangement to enable it to be operated with eight tube passes during the summer months and 16

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First stages of Mobil Oil Company's new LPGas recovery unit at Coryton, Essex.

tube passes during the winter months.

Heat input to the de-ethanizer tower is by means of a thermosyphon horizontal reboiler. The reboiler is fed from a total draw-off leg fitted to the bottom tray of the tower and is recirculated back into the column just below the bottom tray.

The de-ethanizer bottoms at 230°F exchange heat with the de-ethanizer feed in a heat exchanger. The level at the base of the de-ethanizer tower is controlled by an averaging level controller cascaded with a flow controller. The flow controller also reduces the pressure of the de-ethanizer bottoms from 500 psig to 180 psig at which pressure the feed enters the depropanizer on tray number 17, 19 or 21; tray number 36 being the top tray.

The depropanizer operates at a pressure of 180 psig. The tower pressure is controlled from a narrow span pressure controller split between two control valves, one on the cooling water flow from the overheads condenser and the other on the gas line from the reflux drum, which prevents back pressuring by venting incondensable gases to the refinery fuel gas main. The depropanizer top temperature is controlled at 102°F by means of a differential vapor pressure cell cascaded with a flow controller on the reflux to the top tray of the tower (normally 4:1 reflux ratio). The bottoms temperature is controlled at 192°F from a differential vapor pressure cell which resets a flow controller on the steam flow to the depropanizer reboiler. The temperature control systems at the top and bottom of the depropanizer tower are interconnected so that, if conditions occur so as to cause the two systems to oppose each other, i.e., reflux rate approaches a maximum, then the steam to the reboiler will automatically be reduced at the expense of bottoms purity.

Depropanizer overhead, consisting of almost pure propane, pass into a reflux condenser (8 tube pass in summer, 16 tube pass in winter) where it is cooled to 100°F, condensed and passed into the reflux drum. From the reflux drum, reflux is returned to the top tray by means of a reflux pump, so as to control the overhead temperature as described above. Operation is for complete condensation, with incondensable gases being vented automatically from the reflux drum to the refinery fuel gas main.

The level in the depropanizer reflux is controlled by level control on the propane line to the caustic treating section. Similarly, the depropanizer bottoms level is controlled by level control on the butane line to the caustic wash section.

In order to permit close control on the propane and butanes purity a gas liquid chromatographic analyzer (Perkin-Elmer Corp.) has been installed in the LPGas unit control room. At present this instrument analyzes the propane from the top of the depropanizer and gives an analysis of this stream every 15 minutes; this permits the operator to control the operation of the de-ethanizer bottoms and depropanizer overheads within very close limits. Eventually this chromatographic analyzer will also analyze the butanes from the bottom of the depropanizer thus permitting close control on the purity of the butanes.

Propane is cooled to 80°F prior to entering the caustic treating section where it meets a stream of circulating 20 weight percent, caustic soda. The combined stream passes through an orifice mixer and enters the bottom of the propane de-emulsifier where the initial separation of propane from the caustic takes place. Propane and caustic pass overhead from the propane de-emulsifier and on to the propane settler. Here the propane and caustic separate into two liquid phases. Caustic is circulated under flow control from the base of the propane settler while the washed propane is taken overhead.

The washed propane passes on into the propane drying tower or its space where it is dried by passing upwards through a bed of calcium chloride. Leaving the drying tower the propane passes through a back pressure controller and on to storage—the back pressure controller having been installed in order to hold a high pressure on the caustic and drying system in order to prevent vaporization.

The depropanizer bottoms leave the base of the depropanizer tower and are cooled to 100°F before passing to the butane caustic washing system which is identical with the propane caustic washing system. Leaving the caustic settler the butane passes through a back pressure controller and on to storage.

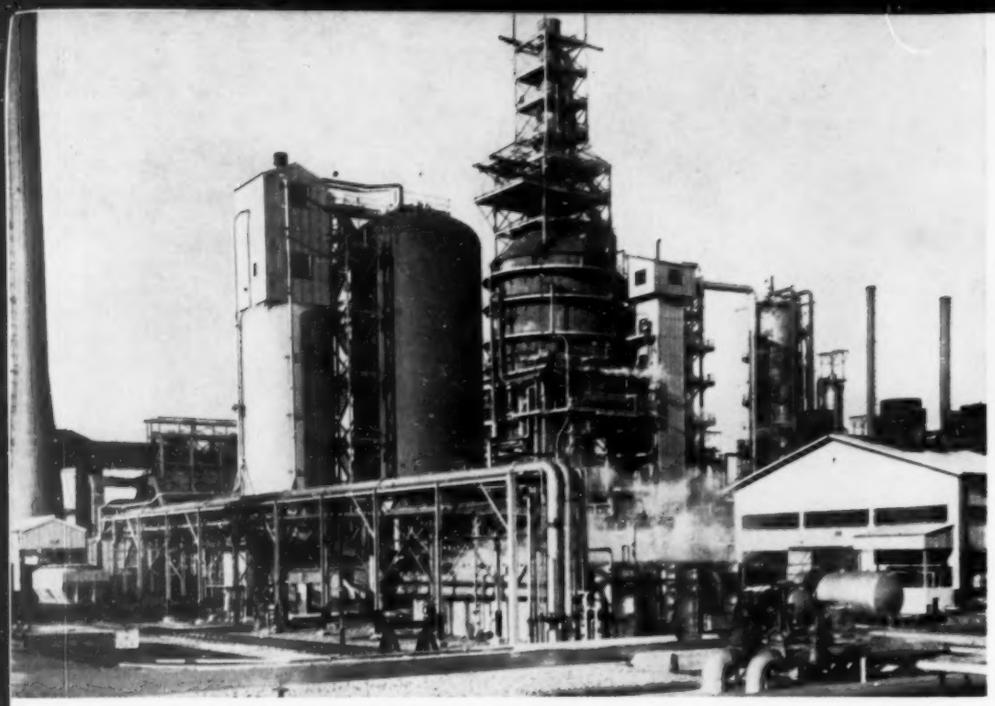
Propane from the LPGas unit runs down into the propane sales storage area or the refinery propane storage area. Each storage area consists of three bullets, each bullet being of approximately 400 barrels capacity. The sales storage area is used for direct sales while the refinery propane storage area is for supply to the methyl ethyl ketone dewaxing (as a refrigerant) and propane deasphalting units. A supplementary calcium chloride dryer has been erected in the propane sales area in order to provide extra drying facilities should for any reason the propane leaving the LPGas unit be wet. Storage for butanes from the LPGas unit is in two 30 feet spheres in the sales storage area.

There are four road wagon loading points each for propane and butanes and three rail loading points each for propane and butanes. Each loading point is capable of loading approximately 10 tons per hour.

END

Melzo, Italy. Time to start work for Renato Raggi, owner of a BP Petrol Station. By the end of this year —BP's first year in Italy—some 1500 BP s ations will be in operation along Italian roads.

BP



Above: South refinery with platformer unit in foreground and distillation plants on right.

Left: General view of the catalytic cracking unit (Photos courtesy Shell).

Royal Dutch/Shell contributions to UK refinery developments

CONFIDENCE in a continued steady increase in the demand for oil in the United Kingdom—particularly for industrial fuels—has been reflected in refinery expansion. The UK's consumption of petroleum now amounts to about 34 million tons a year, or 14% of the country's energy requirements.

The capacity of the Shell Refining Co.'s refinery at Shell Haven, in the Thames estuary, was doubled by the addition of a second crude-oil distillation unit which came onstream early this year, bringing the refinery's crude distilling capacity to about eight million tons a year.

Other projects in progress or at the blueprint stage will give the United Kingdom a total oil-refining capacity of 46 million tons a year in the near future, compared with two million tons immediately before the war. The contribution of the Royal Dutch/Shell group of companies, with four refineries, at Shell Haven, Stanlow (Cheshire), Heysham (Lancs.), and Ardrossan (Scotland)—is at present approximately 15 million tons per annum.

The petroleum refining industry is always changing: Competition, improved engines, changing marketing requirements, are continually spurring on developments in oil chemistry and changes in the refining pattern. Catalytic cracking was probably the most important refining development of the 1940's. The present decade has brought new developments which are having far-reaching effects on the processing pattern.

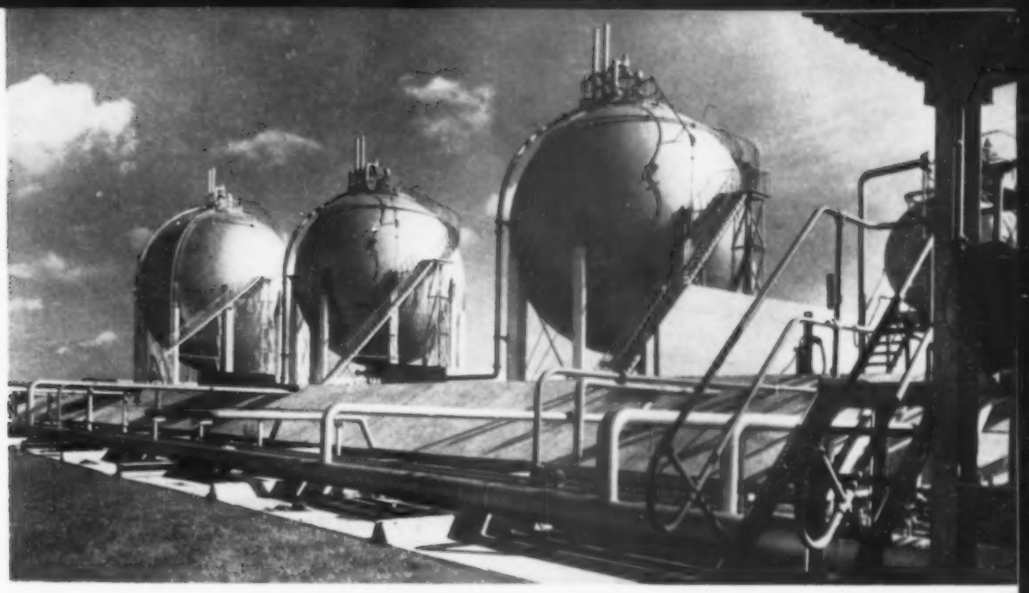
The demand for higher octane gasoline suitable for use in engines of higher compression ratios has continued. To meet these demands, a number of catalytic reforming processes have been developed to improve the antiknock properties of gasoline produced by the primary distillation of crude oil.

Probably the most successful of these is the Platforming process, which employs a platinum catalyst, an increase in octane number being achieved by selective conversion of certain molecular types in the feed stock. Catalytic reforming now has an established place in the refinery pattern. In some areas the Platforming capacity may be as much as 20% to 30% of crude-oil capacity. It is particularly suitable for United Kingdom and western European refineries generally, where a high proportion of the total gasoline is of the high-octane grade.

Shell brought the first Platforming unit in Europe onstream at Stanlow at a cost of £3½ million as far back as December 1953. This plant was designed for the manufacture of an aviation-gasoline component, and has operated as such. In June 1956, a second Platforming unit costing £2½ million was brought into use at Shell Haven to produce a high-octane component for blending into motor spirit. This plant contributed greatly towards the introduction of 100-octane motor spirit by Shell to the British market in July of that year.

Since 1948 hydrodesulfurization—by which is meant catalytic hydrogenation for the removal of sulfur by its reaction with hydrogen to form hydrogen sulfide—has become an important feature of the refinery pattern. The availability in refineries of hydrogen as a byproduct of the catalytic reforming plants has led to the development of several commercial hydrodesulfurization processes.

In April 1955, the Shell Refining Co. put into service at Stanlow the first hydrodesulfurizer of its kind in the world. Costing £1 million, and almost entirely British in both manufacture and materials, the plant was developed by the Royal Dutch/Shell research organization at Amsterdam



Above right: Butane and propane facilities at Shell Haven refinery, seen from the pumphouse.

Reforming plant showing (extreme left) the flash fractionating column and (extreme right) the stabilizer column and gasoline splitter column. In the centre background are the pre-fractionating and stabilizing columns of the plattorming plant.

to increase the supply of automotive diesel fuel of low sulfur content. It works on the "trickle" technique (a Shell patent), so called because the oil to be desulfurized is contacted with hydrogen and made to trickle over a special catalyst. The hydrogen converts the sulfur compounds into hydrogen sulfide, which is separated from the oil and then itself converted to pure sulfur for sale.

This plant has added still further to the reputation of Stanlow as one of the most comprehensive oil refineries in the world. A second and similar Shell trickle phase hydrosulfurization unit is to be brought into operation at Shell Haven next October with a capacity of 2,400 tons a day.

Another Stanlow development was the completion at the end of 1958 of an £800,-000 Udex unit with a capacity of about 1,000 tons a day. It uses as feed stock the product from the nearby Platformer unit. A glycol mixture preferentially dissolves the aromatic components of the feed stock. The aromatic extract is distilled off from the solvent and used in aviation gasoline, while the insoluble nonaromatic portion is used as additional feed stock for other processes.

The mid-1950's saw refinery gas beginning to play an increasing part in the United Kingdom in supplementing coal gas for industrial and domestic use. In 1956 Shell Refining signed an agreement with the North Thames Gas Board by which Shell Haven refinery is now supplying 25 million therms of refinery gas each year to the board. A unit has been built at the refinery to purify and dry the gas, and the gas board have laid a 24-in. main 17 miles long from the refinery to the board's works at Romford (Essex). There, the gas is transformed to town's gas of normal calorific value and fed into the board's grid. The amount of gas purchased is equivalent to carbonizing a quarter of a million tons of coal a year.

Efforts are continually being made to streamline refinery operations and make them still more efficient and economical. During the routine shutdown of the Stanlow catalytic cracking unit in 1957, engineers installed a special boiler for raising steam, the first of its kind in the UK. Instead of conventional fuel, this boiler uses mainly hot gases from the "cat cracker" which were formerly discharged into the air. Its installation has made possible the saving of 30,000 to 40,000 tons a year of heavy fuel.

Supertankers Project: In preparation for the introduction of the supertankers now being built, the Mersey Docks and Harbor Board and the Shell Refining Co. have planned a major installation at Tranmere, on the River Mersey, near Liverpool, which will ultimately be capable of handling eight million tons of crude oil a year in transit to Stanlow refinery, nine miles away.

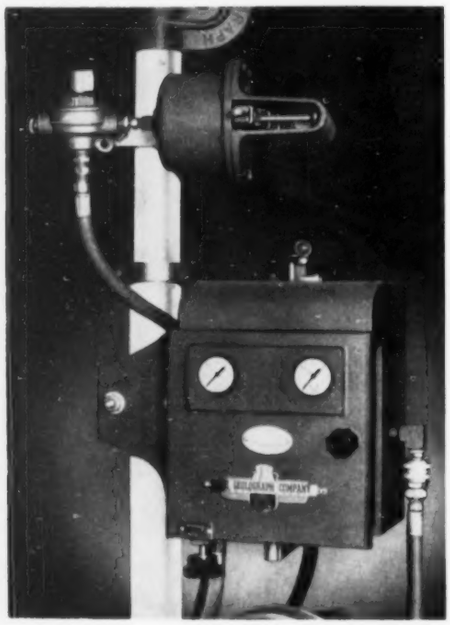
Work is now in progress on two large floating stages, each capable of taking a fully loaded 65,000-ton tanker, and even larger vessels on a restricted draft. Each stage will be 362 ft long and 60 ft wide, and floating mooring dolphins of a novel type will be provided ahead and astern of each stage to enable vessels of 850-ft overall length to be safely secured. These dolphins, designed by engineers of the Shell Refining Co., contain new and ingenious features, and will allow a considerable saving in construction costs.

The whole scheme is planned to allow for the large tidal rise and fall (over 30 ft) of the Mersey. Access to the two-berth oil stage will be by a forked approach jetty carrying roadway, footway, and pipelines ranging from 16 in. to 30 in. in diameter, in addition to light, power, and telephone cables. The oil will be pumped ashore through pipelines into balance tanks on reclaimed land nearby, then by shore pumps to Stanlow. END

Automatic drilling weight control

James O. Melton, research engineer for the Geolograph Co., Oklahoma City, also serves the University of Oklahoma Research Institute in a similar capacity and has been an associate professor of theoretical and applied mechanics at the university since 1952.

by James O. Melton



Geolograph automatic weight control device for greater automation of rotary drilling.

The Automatic drilling weight control device, manufactured by The Geolograph Company, under the name of "Geodril," is a simple control device of the detachable type for use on any type rotary drilling rig. This equipment consists essentially of an automatic control system and necessary sensing equipment, together with actuating means to operate the drawworks brake handle and includes safety control devices to assure safety in operation.

Any automatic control system has two prime components: The first is the process and in the case of this equipment, the process is the feeding off of the brake in the same manner as the driller does when he watches the weight indicator and decides he needs more weight on the bit and so causes more line to be fed off the brake drum producing the additional weight on the bit.

In the process of controlling drilling, the driller must have some indication of the weight on the bit and in a most similar manner, the controller or second component of the system must sense this weight. Since most weight indicators work from some form of device on the deadline or at the end of the deadline, the Geodril automatic driller also has a diaphragm or other weight sensing element attached to the deadline. This element is made in such a manner as to be readily fastened to the deadline with attached hooks and clamps.

The sensing system is hydraulic and as such is filled with a hydraulic medium. A hose connects the weight sensing device with the controller so that the sensing of the diaphragm operates a bourdon tube which in turn actuates the control. This control is a very sensitive air actuated bleed type system such that an increase in sensing pressure causes an increase in output air pressure. This output air pressure actuates an air motor which is attached to the brake handle by means of a flexible line.

Twist-off and weight control safety measures are incorporated in the system, blocking the air supply and venting the air to the atmosphere, should a failure occur.

Further safety measures include a control against over-feed and is incorporated as a component to be attached to the existing drawworks. Any air pressure greater than 20 psi will operate the system and therefore, most any air supply can be used.

The Geodril controller is ruggedly constructed, yet is easily portable and may be installed on any conventional rotary in a few minutes time.

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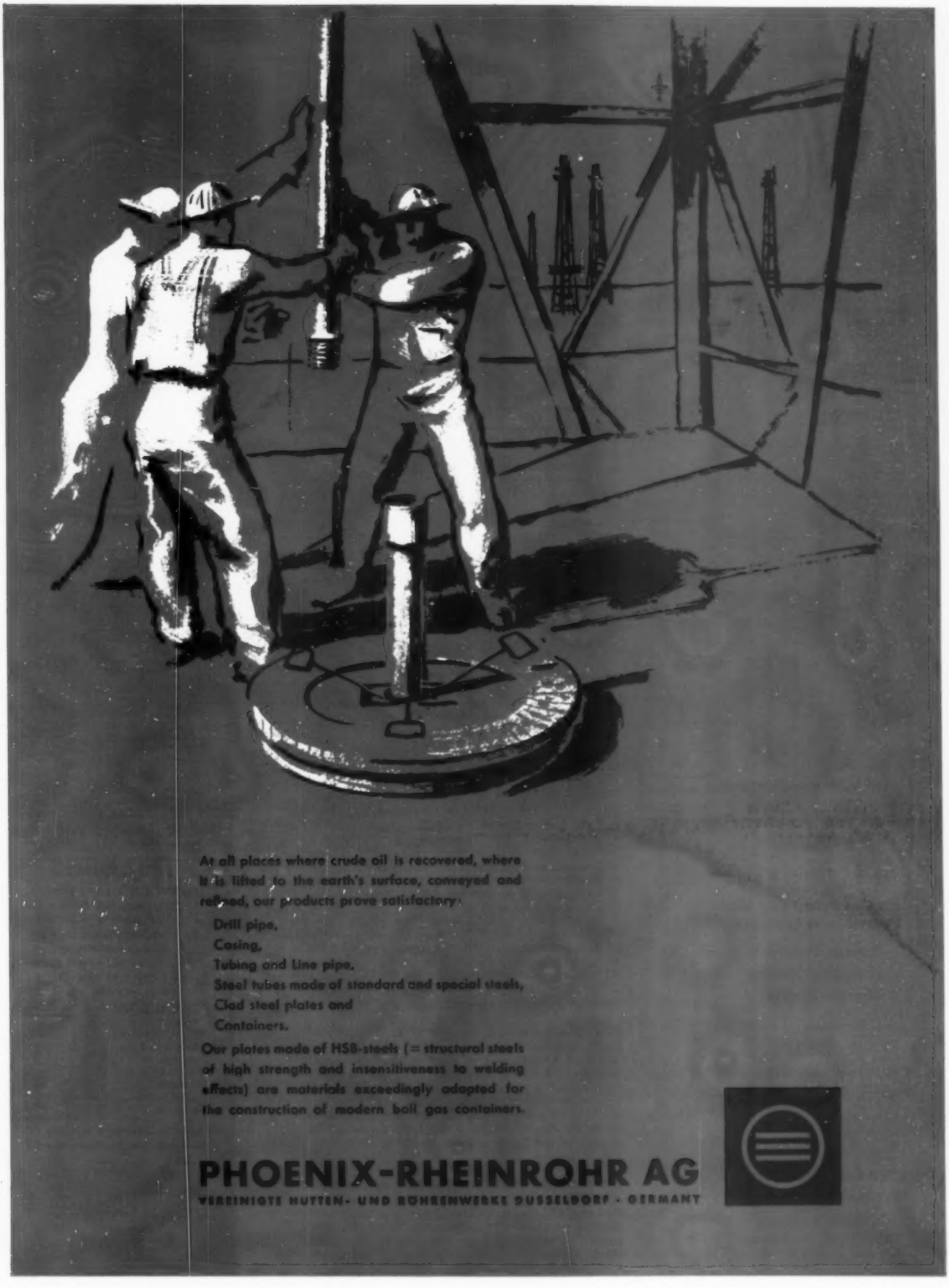
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OIL COMPANY STAFF CHANGES

OLE BERG, JR. has been elected executive vice president and a director of Sunland Refining.

DAN L. MAYER has been advanced to manager of Phillips Petroleum Company's natural gas department. R. B. Stewart held this position until his recent promotion to vice president, natural gas. Mr. Mayer became general superintendent of the natural gas department in 1951 and has been assistant manager of the department since 1956.

W. ALTON JONES has been elected chairman of the executive committee of Cities Service Co., and Burl S. Watson as chairman of the board and chief executive officer succeeding Mr. Jones in those capacities. At the same time the board elected J. Ed. Warren as president, succeeding Mr. Watson.

Three senior vice presidents were elected. They are A. P. Frame, Charles S. Mitchell and George H. Hill, Jr. Two new vice presidents were elected. They are Erle G. Christian, formerly secretary, and Edward L. Stauffacher, formerly president of the company's eastern region subsidiary, Cities Service Oil Co. (Pa.). Frank K. Foster was elected secretary, succeeding Mr. Christian.

C. N. BROOKS has been named Eastern Hemisphere vice president for Texaco. He is on the Caltex board. **GREER W. ORTON** has been made treasurer; and **STANLEY T. CROSSLAND,** vice president and formerly treasurer, has been named vice president for finance and economics. **ROBERT FISHER,** formerly financial vice president, has retired after 50 years with Texaco.

RICHARD C. McCURDY, president of Shell Chemical Corp. and a director of Shell Oil Co., has been elected a member of the executive committee of Shell Oil Co.

HERBERT I. HARRIS has been named chief geologist in charge of operations for Magellan Petroleum Corp. in Brisbane, Australia where company will initiate an extensive program of geological and geophysical work on 27,000,000 acres of concessions in the Great Artesian Basin of Queensland.

K. SCHOLTENS of The Iranian Oil Exploration and Producing Co. and the Iranian Oil Refining Co. has retired as chairman and general managing director of these companies. Mr. E. W. Berlin succeeded Mr. Scholtens.

J. FRANK DRAKE has resigned as an active director of Gulf Oil Corp. board. In recognition of Mr. Drake's outstanding service to Gulf that began 40 years ago, the board designated hiim Director Emeritus, the first such title conferred by the 58-year-old company.

LOREN L. WARE, vice-president in charge of exploration, has been elected a member of the board of directors of Sinclair Oil & Gas Company, Tulsa.

GERALD J. SMITH has been elected vice president in charge of purchasing and estimating by Catalytic Construction Co. He was formerly Administrative Assistant to the President.

HOWARD C. KAUFFMANN, Jr. has been appointed manager of operations at Talara, Peru for International Petroleum Co., Ltd. He succeeds Clarance Nielsen who has accepted an assignment with the Iran Oil Operating Companies. Mr. Nielsen's move to Iran follows more than 17 years of service with International in Ecuador, Colombia, Venezuela and Peru.

Succeeding Mr. Kauffmann is William J. Nutt, presently International's producing superintendent in Talara who joined International in 1945, when he was assigned to the company's operations in Colombia. He was transferred to Peru in 1958 and in October of that year was appointed the company's producing superintendent for Talara operations.

T. A. KIRBY has been appointed manager of western hemisphere exploratory operations for Gulf Oil Corp. at New York. He succeeds Augustin Pyre who has gone to London to replace E. S. Bleeker when Mr. Bleeker retires as manager of exploration for Gulf Eastern later this year.

Mr. Kirby joined Gulf as a geophysicist in 1934 and has been with Mene Grande in Venezuela since 1939. Mr. Pyre joined Gulf in 1937 and has served in Europe and Latin America as well as in the United States.

PAUL E. TALIAFERRO has been elected president and chief executive officer of Sunray Mid-Continent Oil Co., Tulsa. He succeeds W. C. Whaley, president for past seven years, retired. Mr. Whaley will remain as chairman of the executive committee. C. H. WRIGHT was re-elected chairman, and R. W. McDOWELL, president of DX-Sunray Oil Co., wholly owned subsidiary.

THOMAS C. BARGER has been elected president of Arabian American Oil Co., succeeding Norman Hardy who becomes chairman on retirement of Fred A. Davies. Mr. Hardy continues as chief executive. JOHN NOBLE, Tapline president, has been named to Aramco board.

FATTOLAH NAFICY, director of Exploration and Production has the Iranian National Oil Co. (NIOC) will visit Venezuela as a guest of the Ministry of Mines and Hydrocarbons. Mr. Naficy will tour the local oil fields and converse with ministry officials here. EVERETT F. WELLS, president of the Ashland Oil & Refining Co. will visit the concessions of the Phillips Petroleum which is partly owned by the Cleveland Tankers Co., subsidiary of Ashland Oil.

DR. RICHARD A. GEYER has been named manager of the gravity department of Geophysical Service Inc. He has been chief geophysicist of the gravity department since 1954 in Houston, Texas. He succeeds F. E. Romberg, who was recently appointed chief geoscientist for the newly-formed GeoSciences and Instrumentation Division of GSI's parent company, Texas Instrument Inc.

H. V. Hyde

H. J. Rose

HERSCHEL Y. HYDE, Tidewater Oil Co. has been appointed group vice president for manufacturing, marketing and petrochemicals. He will continue to make his office at the company's Los Angeles headquarters.

HAROLD J. ROSE has been elected a vice president of Esso Export Corp. He will also serve as general manager of a new chemicals department being formed by Esso Export to assist Jersey Standard's overseas affiliates which market chemicals. Mr. Rose was formerly assistant general manager of the chemical products department of Esso Standard Oil Co. as well as a vice president of Enjay Co., Inc.

PAUL D. BALBIN has been appointed general manager of Chaco Petroleum, S.A. Bolivian subsidiary of Tennessee Gas Transmission Co. at Cochabamba. He has been employed as chief geophysicist for Chaco since March, 1958. He succeeds W. B. Tapper, who resigned recently.

LAWRENCE C. HAMLIN, executive development advisor of Standard-Vacuum Oil Co., has been appointed regional vice president at the company's headquarters with responsibility for its Far East operations. The appointment was effective on June 1.

One of five regional officers, Mr. Hamlin will coordinate all of the company's interests in Japan, Korea, the Philippines, Hong Kong, Taiwan, Viet-Nam, Cambodia, Laos, Thailand, Malaya and Singapore. He succeeds J. V. Pickering, a director who will be responsible for Stanvac's marketing operations.

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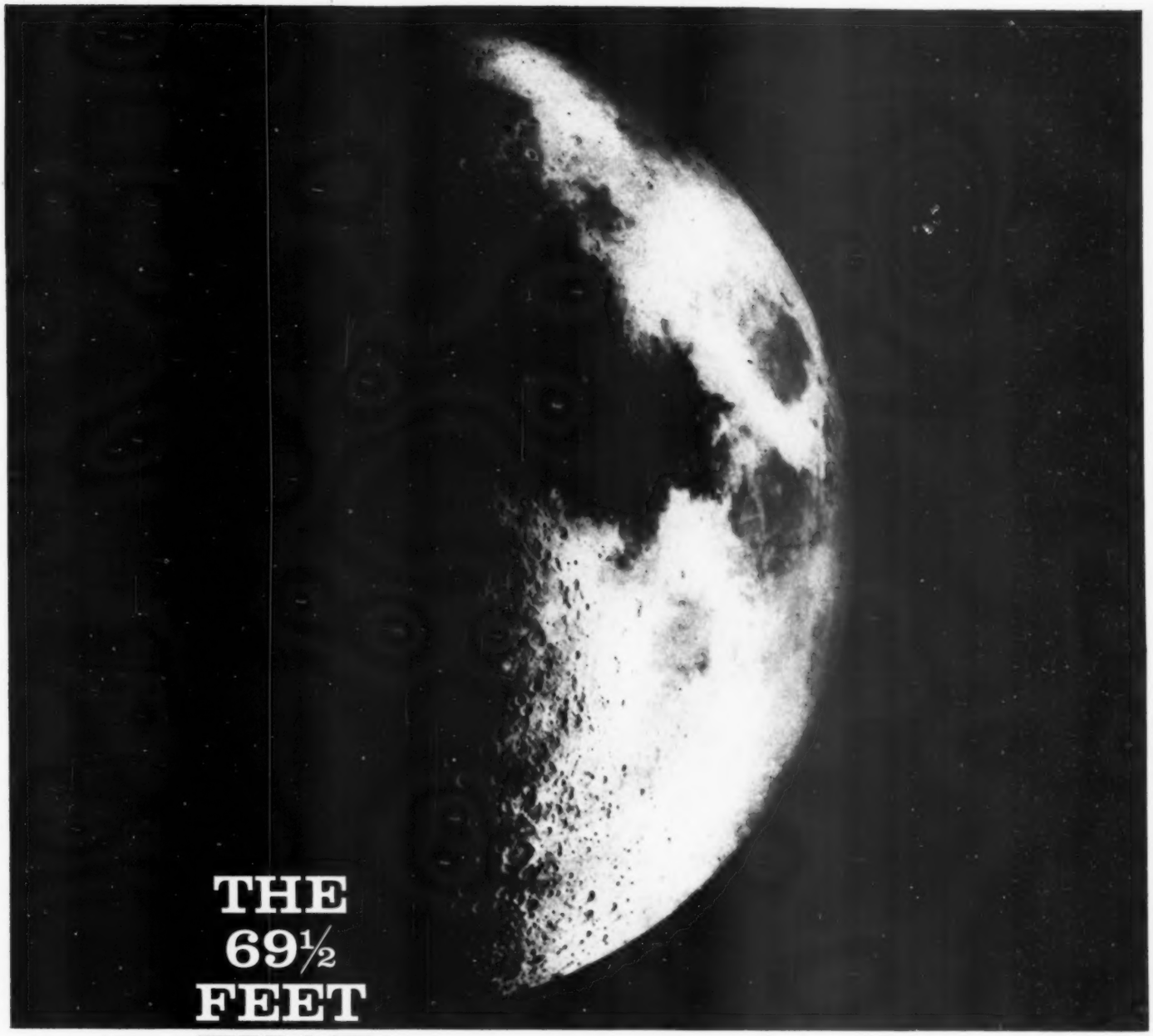

THE 69½ FEET THAT REACH THE MOON

Time: One hundred years ago—1859.

Place: Titusville, Pennsylvania.

Event: The first U. S. oil well "came in" at 69½ feet. And from it and its successors have come endless miracles of oil.

Today, petroleum gives us fuels that are capable of moving man from earth to the moon and beyond. Such explorations can bring new knowledge of incalculable value.

But no less certain than the conquest of space is that we will have ever better fuels and lubricants for travel on the ground, on the sea, and in the air—new and exciting products for the farm, industry and the home.

Today it is estimated that one quarter of all the money spent by U. S. industry on research is spent by the petroleum industry.

And as chemists study the endless ways to rearrange oil molecules to make useful products, we can see that the age of petroleum has only begun.

Standard Oil Company (New Jersey) Esso

Persons-Beauchamp Agency Formed

Persons-Beauchamp Advertising, Inc. is the new name for the agency group formerly known as The McCarty Co. in Houston, according to Ed Beauchamp, president of the company. Officers and personnel of the organization remain unchanged. Howard Persons is chairman and Hal Jones is vice president. The agency maintains offices at 2472 Bolsover in Houston and has affiliates in New York, London, Paris, Zurich, Tokyo and most major cities in the United States.

Solvent Dewaxing Plant

Plans to construct a $7-million solvent dewaxing plant at its Tulsa refinery have been announced by DX Sunray Oil Co. Completion date is Aug. 1, 1960. The new unit will enable DX Sunray to produce, for the first time, microcrystalline wax in large commercial quantities.

Vienna Agreement For Cardwell

The Austin company Mannesmann-Trauzl AG and Cardwell Manufacturing Co., have signed a non-exclusive licensing agreement which permits the Vienna company to construct combined Cardwell-Trauzl drilling rigs on customer's request. Only certain licensed parts such as draw works and power units may be made after US blueprints while pumps, mast, rotary table, etc. will be built after company's designs.

Gulf Benzene Plant On Stream

Gulf Oil Corp. has begun operating its new benzene plant at the company's Port Arthur refinery. The plant has a capacity of 30 million gallons yearly. Substantial amounts of toluene are also produced.

J. Morris

W. G. Sharp

Sharp Heads Export Sales

Continental-Emsco Co. has appointed William G. Sharp manager of its export division at New York City, and JoEarl Morris to manager, Continental-Emsco Co. C.A., Caracas, Venezuela. Mr. Sharp was previously manager of Continental-Emsco's Venezuelan company and Mr. Morris was his assistant.

Owsley Named Halliburton Director

William D. Owsley, senior vice president, was elected a director of Halliburton Oil Well Cementing Co. following the company's recent annual meeting.

Marvin K. Brummett, secretary, was elected vice president and secretary. John P. Harbin was elected financial vice president, a new position, and J. E. Thomson, chief accountant, was elected controller and assistant secretary.

Terrell Joins Stewart & Stevenson

Joe Terrell has been named sales engineer for Stewart & Stevenson Services, Inc. specializing in oilfield service equipment, according to Joe Manning, vice president and general manager. Mr. Terrell formerly was chief engineer of Baash-Ross Tools.

J. Terrell

J. Helies

John Helies Heads Security

John C. Helies has been appointed President of Security Engineering Division of Dresser Industries Inc. Security is a Dallas-based manufacturer of rock bits and down hole tools, with manufacturing facilities in Whittier, California and Manchester, England. Mr. Helies was formerly executive vice president and general manager of Security.

New Soviet Book

Geochemical Methods of Prospecting and Exploration for Petroleum and Natural Gas—by A. A. Kartsev, Z. A. Tabasaranskii, M. I. Subbota, and G. A. Mogilevskii, English translation edited by Paul A. Wotherspoon and William D. Romey. Scientists in the Soviet Union have developed an impressive number of geochemical methods of prospecting for petroleum. The results of this research are presented by members of Gubkin Institute of Petroleum and Gas Industry and the Research Institute of Petroleum Geology (both in Moscow), who on the basis of long experience are well qualified to discuss the subject from the Soviet standpoint. Published by University of California Press, Berkeley 4, California. Price $4.00.

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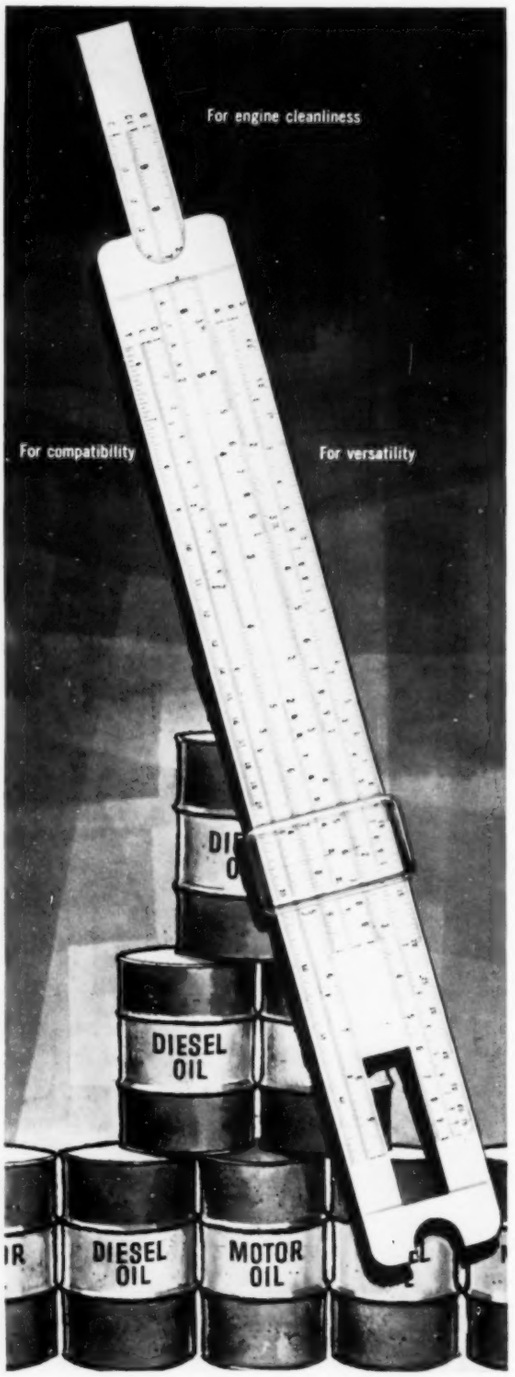

20/20 VISION...

The field of nuclear logging received its greatest advancement when McCullough introduced the Scintillometer back in 1949.

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Call McCullough on your next job – you'll get the best logs you ever had – and you'll benefit by more accumulated experience in nuclear logging with the scintillation crystal than all others combined.

INTERNATIONAL NEWS AND NOTES

Lebanese Oil Agreements

The Lebanese Government and Iraq Petroleum Co. jointly announced in June that negotiations between the two parties had been concluded successfully, and three separate agreements drawn up dealing with crude transit in pipelines across Lebanon, loading of crude at the Tripoli marine terminal, and with the Tripoli refinery.

Total company payments after ratification of the agreements in respect of the Tripoli refinery and the transit and loading of 7½ million tons of oil annually amount to 1,235,000 pounds sterling—equivalent to about £L (Lebanese pounds) 11 million a year. This compares with some £L 3,250,000 a year paid by the company under the terms hitherto in force. The agreements include the following additional important provisions: (a) when the agreements are ratified the government will receive from the company a lump sum of 5,818,000 pounds sterling (equivalent to about 51,500,000 Lebanese Pounds) in settlement of all government claims on the company for the past, including transit due claims from 1952. (b) 20% of all product supplies from the Tripoli refinery for Lebanon consumption will be available to Lebanese marketers nominated by the government. (c) The company has undertaken to provide the money to establish a technical trade school in Tripoli. (d) The company has also undertaken to provide 35,000 Lebanese Pounds a year to be distributed among municipalities in which the company is operating.

Australian Petrochemical Plant

Standard-Vacuum Oil Co. has announced that it will build a $28 million petrochemicals plant at Altona, near Melbourne, Australia this year. The plant will supply high purity chemicals derived from petroleum for use by three other units which will produce polyethylene, styrene, and GRS synthetic rubber. The entire project represents some $50 million of investment in Australia's first large petrochemicals industry. Engineering studies are already under way and it is anticipated that construction will begin in the final quarter of 1959 with completion scheduled for mid-1961. The plant's output will include approximately 20,000 tons of ethylene a year and the butadiene required for the manufacture of 30,000 tons of synthetic rubber.

Italo-French Refinery To Romania

The French firm ENSA (Schneider Group) and the Italian Company, Ansaldo have concluded an agreement with Romanian Maschino-import for supply of a complete refinery for Ploesti, valued at $11 million. Ansaldo, a big Genoan mechanical firm, will supply distillation towers, heat exchangers, ducts and minor units. The negotiations are being conducted by Minister Petri and Dr. Campeanu, general director of Maschinoimport on the Romanian side, and by Mr. Ettore Gabetta and Mr. Ugo Pini Prato for the Italians.

New Esso Refinery In Germany

Plans for construction of a large refinery in Karlsruhe, West Germany, have been announced by Standard Oil Co. (New Jersey). The new refinery is scheduled to be completel late in 1962 and placed in operation on January 1, 1963. It will be supplied through the South European Pipeline when completed.

Phillips-Sunray Enter Australia

Phillips Petroleum Co. and Sunray Mid-Continent Oil have jointly acquired interest in two concessions in Queensland, Australia, covering 41,400-000 acres.

Nigeria Refinery Studied

Shell-B.P. Company is studying the possibility of a 10,000 b/d refinery in Nigeria. Production in 1959 is expected to reach about the same level and the company is under obligation to study the economic feasibility of a refinery after six months of production at the rate of 10,000 b/d or more.

Austria's EPG Merges With OeMV

Erodoelproduktions-Gesellschaft m.b.H. (EPG), Vienna, owned by the Austrian state company, OeMV, will be merged completely with OeMV. EPG is a nationalized company with a payroll of 154 and an annual production of about 33,000 tons (660 bbls/day) of oil. Fields are located at Goesting (Lower Austria province) amidst the OeMV fields. EPG was founded in 1931.

Syrian Oil Development

Newspaper reports in Syria say that the Syrian Petroleum General Assembly will resume exploration and drilling in the Karachock field. The reports say that six new wells will be drilled there this year. The reports estimate the petroleum reserves at 150 million tons.

The report says the Petroleum General Assembly will invite bids for construction of a 12-inch pipeline from the oil field to the Mediterranean.

French Oil Strike

Discoveries continue in France. New finds include: Nangis No. 1, which went to 2,534.70 meters in the Permo-Trias, after crossing some levels of sandstones without shows. After perforation, a test was conducted in the Charmoutian series around 2,265 meters: the well yielded between 3 and 10 cubic meters (20-63 bbls) during an unspecified test period. The well has been put on production. Nangis No. 1 is on Chalons-sur Marne permit of Régie Autonome de Pétroles. The rig, an Emsco GB 800, has been moved to Bresse Sud 1.

Brie 101 was completed and put into production on March 11. It produced between 30 and 45 cubic meters a day currently; the flow has been reduced for the time being to 24 cubic meters/day (151 bbls/day). The company announced that "this encouraging result on Brie 101 lead us to contemplate a drilling campaign to begin immediately."

At Coulommes, 23 wells have been completed, 17 of them good producers, others being either poor producers, or under observation. Wells over 6,000 ft are drilled and completed in about twelve days using a turbo-drill in soft formations as in Coulommes.

The main point of interest, however, in the Parisian Basin remains the find of Copesep in Saint-Martin-de-Bossenay. This could very well be the most important find in France since Perentis. Company officials show much optimism. New shows have been encountered below the known pay and more tests have been operated.

Yugoslavia Firm Lays Gas Pipeline In India

The Crude Oil Institute of Zagreb, Yugoslavia, won the bid for the construction of the 105-mile-gas pipeline from Durgapur to Calcutta, India, against competition from some German and Austrian firms. The Sisak Ironworks will deliver the 11.7 in. pipes. The pipeline will cost about $6 million and is to be built during the dry season between October and May.

Bryan Ruling On Tankers

Judge Frederick van Pelt Bryan of the U. S. District Court of New York ruled recently against the nation's two largest maritime unions who had asked for dismissal of a complaint that their December 1958 boycott against "Flags of Necessity" ships was a conspiriacy to restrain foreign commerce.

USSR Oil Ports At Baltic

A Finnish trade delegation returned from Moscow with the news that the Soviet Union is about to shift her loading of tankers from Black Sea ports to the Baltic. For this purpose, the USSR built an oil port in Klaypeda (Lithuania). Another oil port is to be built at Ventspils (Latvia) for oil products destined for Scandanavia and other ports in the West.

3rd RAG Discovery In Austria

RAG will soon have its 3rd oil well in Upper Austria province on production. Well Ried No. 1 encountered oil-impregnated layers between 4,459 and 4,508 ft. The oil is similar to that of Puchkirchen No. 1. Drilling reached final depth at 4,567 ft on March 31, 1959.

Soviet Drilling In Afghanistan

The Soviet Union, which in cooperation with Romania and Czechoslovakia is carrying out exploratory drilling in the northern part of Afghanistan, has set up the first deep-drilling rig at Sar-I-Pul. Another such rig is being installed at Shibirghan.

Italian-Polish Pipeline Team

A delegation of the ENI-AGIP group has gone to Warsaw to discuss Italian cooperation in laying an oil pipeline across Poland. This will be part of the COMECON-pipeline, which will supply East Germany, Poland, Hungary, and Czechoslovakia with Soviet crude. The line will start in the Ural mountains and lead in a western direction across the Volga River, where it will divide into two branches. One branch will proceed to Wlohclawek, 75 miles northwest of Warsaw, where a 4-million-ton-per-year refinery is to be built, and continue to East Germany, where likewise a refinery is to be erected. The other branch will cross over into Czechoslovakia at the Soviet-Slovak border and supply the refinery at Bratislava. From there, the line will continue to the synthetic gasoline works in Most, Bohemia, while another line will branch off from the Slovak section to the capital of Hungary, where a new refinery is to be built.

ENI's SNAM-Progetti company may assist Poland in the laying of the pipeline and ENI's Nuovo Pignone company, Florence, may assist in the search for gas. The latter company has already received an order for compressors for Poland's chemical industry. Discussions are now under way for the delivery of IDECO drilling rigs, which this company is manufacturing under license of the U.S. firm.

Under an agreement with the Soviet Union, signed in March, Poland is to receive in the 1959-1964 period some seismic equipment and 50 drilling rigs, probably turbines, for depths of 13,124 feet.

In 1958, the Polish oil industry drilled 296,510 ft (geological research 118,303 ft, exploration 145,955 ft, production 32,252 ft), of which 285,270 ft were drilled with rotary rigs and 11,241 ft with cable tool rigs. The output was 168,505 tons of crude oil (1957: 180,691 tons) and 12.4 billion cubic ft of gas (14.75 billion cubic ft). The country's 5 refineries turned out 785,472 tons of products (Jedlicze 153,800 tons, Jaslo 170,971 tons, Glinik-Mariampolski 111,866 tons, Trzebinia 288,051 tons and Czechowice 60,784 tons).

Iraqi Crude To Poland

A Polish trade delegation has arrived in Baghdad to negotiate for the purchase of Iraqi crude oil in exchange for tankers and an economic-technical agreement similiar to the new Iraqi-Soviet treaty under which Iraq will get a credit in the value of nearly $140 million.

The deal should reduce dependence by Poland on Soviet crude deliveries. In 1948 Poland imported its crude requirements exclusively from Iran. In 1958 94.9% of crude imports came from the Soviet Union, 3.4% from Bulgaria and 1.7% from Albania. The share of Western countries in Poland's imports of petroleum products has changed similarly in the past 10 years. In 1948 29.4% of imported petroleum products came from "capitalist" countries, 30.8% from East Germany, 15.2% from Hungary, 15.1% from Romania and only 9.5% from the Soviet Union. Last year (1958), 76.1% of imported products came from the Soviet Union, 15.3% from Romania, 5.1% from East Germany, 2.6% from Hungary, 0.7% from other Communist countries and only 0.2% from Western countries.

Czechs Complete Syrian Plant

The 20,000 b/d refinery at Homs, Syria, constructed by a Czechoslovak firm, was completed in June. Technoexport won the bid in March 1957 against competition from British, American, West German and Italian firms. The Homs refinery was Czechoslovakia's largest assignment in the past few years and the biggest ever in the delivery of capital goods to the non-Communist market.

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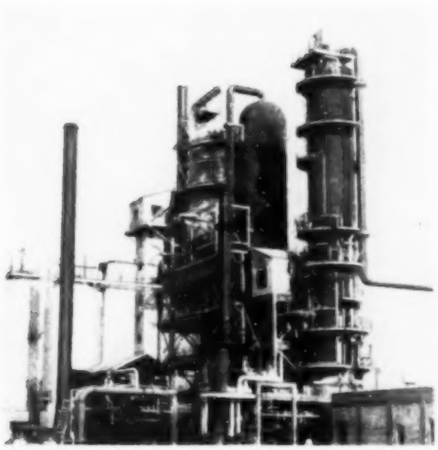
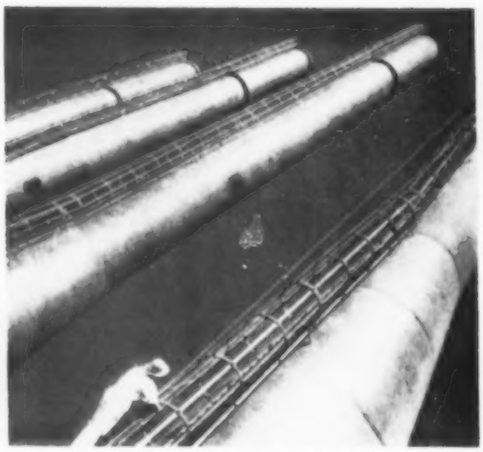


A Montreal refinery. Regenerator towers gunited

Kwinana refinery. Towers gunited



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NATURE'S CATALYSTS (I)

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The production of fire was almost certainly mankind's first scientific discovery, and combustion has been added to the list of catalytic reactions by the comparatively recent recognition of the role of water vapour in the flame. Among all the discoveries of man, none has had such far-reaching effects as the discovery of how to make and use fire. And elevated temperatures have played a major part in chemical experiments and processes throughout the ages.

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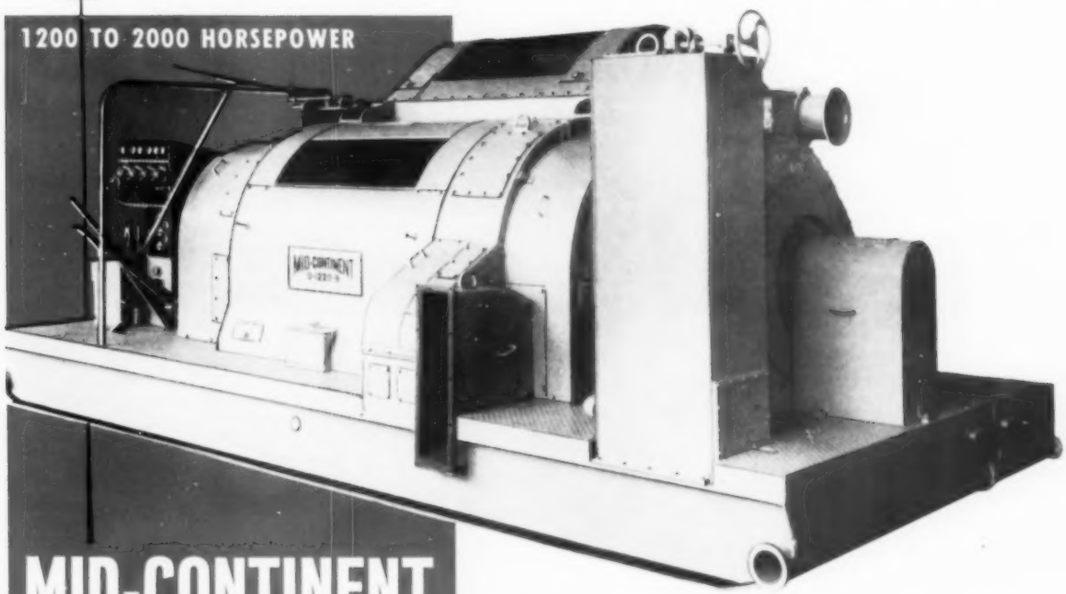

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DRAWWORKS

- SIX FORWARD SPEEDS to the hoisting drum — two reverse speeds.
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Refinery Waste Manual

Volume I, *Waste Water Containing Oil*, of the Manual on Disposal of Refinery Wastes, has been published by the American Petroleum Institute. This is the Sixth Edition, 1959. Orders should be directed to the Publications Department, American Petroleum Institute, 50 West 50th Street, New York 20, N. Y. The price is $2.00 a copy.

Import Curbs Confiscatory

W. K. Whiteford, president of Gulf Oil Corp., said mandatory crude-oil controls are a form of confiscation, and that import curbs represent a contradiction in government policy. After promoting trade among nations as the most effective means of safeguarding Free World mutual security, the government now holds that imports of oil must be cut in the interest of USA mutual security, added Mr. Whiteford.

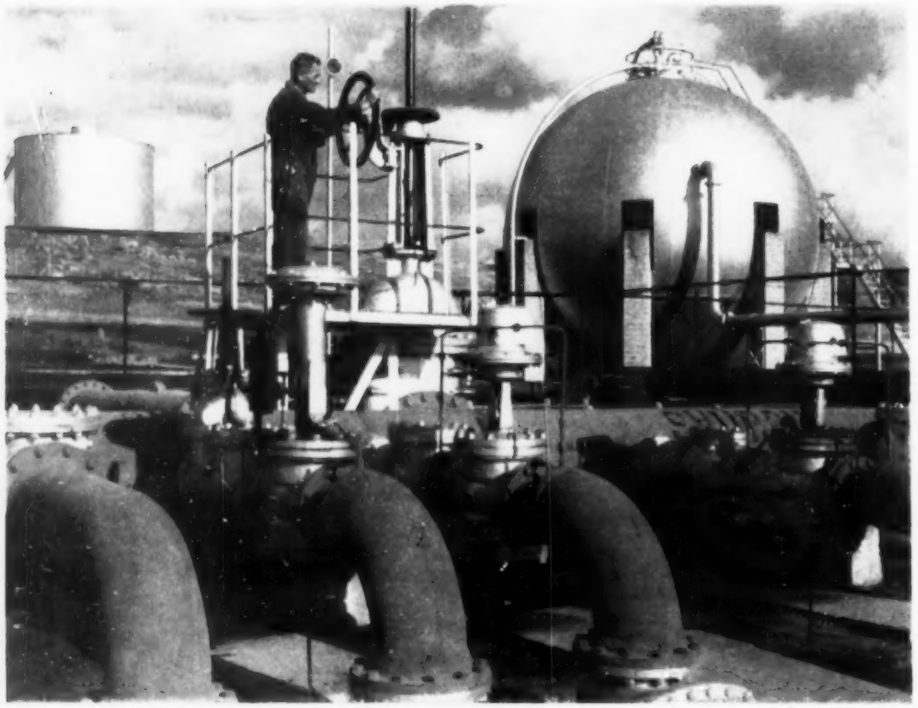
Waukesha Distributor

Oil Field Sales & Service, S.A. has been appointed exclusive sales and service representative in eastern Venezuela and in Colombia for Waukesha engines. Delmar Schmidt will direct the engine field maintenance staff from Anaco, Venezuela. Previously he was a field service engineer with Waukesha in Tulsa.

Wilson International Division

Wilson Supply Co. has established an international division, it was announced by W. S. Wilson, company vice president to market oilfield equipment in all major overseas oil producing areas. The company has opened a New York international sales office at 45 Rockefeller Plaza with Charles Remington as manager. Wayne Harris will manage the Latin American sales for the Wilson Supply International from Houston.

CONTRACTORS TO THE OIL INDUSTRY



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C. R. McMahan

W. R. Sedlacek

E. W. Schnabel

UOP Area Coordinators

Universal Oil Products Co. has assigned three members of its commercial development department as coordinators of sales and licensing activities for specific geographical areas. C. R. McMahan will coordinate U. S., Canada, United Kingdom, Continental Europe and Middle East activities. Coordinator for Mexico, Central and South America and Caribbean area is E. W. Schnabel. W. R. Sedlacek will serve as coordinator for Australia, Japan and the Far East.

Combination Bit

The latest addition to the Reed Roller Bit Co.'s family of insert products is the "YVC Comet" series bit, which combines features of both tooth-type bits and the highly efficient Reed "Cobra" tungsten-car-bits.

The Comet bit was designed to drill formations in the range between the hardest formations which can be drilled effectively by a toothed bit and the formations of extreme hardness in which a tungsten-carbide insert bit is used to best advantage. The Comet combines circumferential teeth with tungsten-carbide inserts imbedded between the teeth and on the gage.

Rankin Elected At Bechtel

The board of Bechtel Corp., engineers and constructors, have elected Clark Rankin to the office of vice president. Mr. Rankin, with Bechtel for twenty-five years, has been active in planning construction and managing many of the company's key projects, particularly overseas.

Italy's Gas Up In '58

According to the General Direction of Mines, in 1958, the Italian production of methane was 5.175 million cubic meters—against 4.987 in 1957. ENI's share amounted to 4.789 million cubic meters in 1958.

To refiners who need more

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Texaco Buys Hi-Energy

Experiment Inc., a leading high-energy fuels research organization, will be taken over by Texaco Inc., through exchange of stock. This will provide Texaco with a new source of research in the areas of high-energy missile and aircraft fuels, advanced propulsion systems, and related chemical development fields. The company will be operated by a wholly owned Texaco subsidiary.

Rockwell Reorganizes Advertising

Joseph A. Mark has joined Rockwell Manufacturing Co. as advertising manager of the company's power tool divisions; W. Richard Bleichner has been named advertising manager, meter and valve and petroleum and industrial divisions; William H. Douglass, Jr., has been promoted to advertising manager, municipal and register divisions and Clifford A. Thompson has been appointed editor-in-chief of Rockwell's eight publications.

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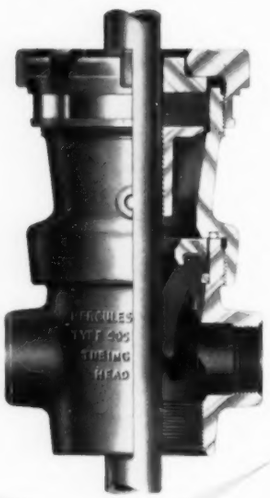
equipment to produce MORE oil at LESS cost

HERCULES TYPE SOS

TUBING HEAD

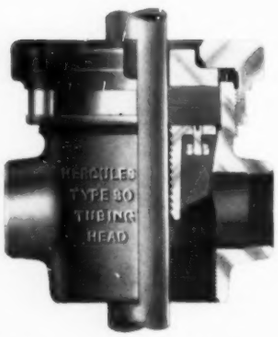
Hercules "Type SOS" is a 4000 pound test stripper tubing head. The lower section contains the neoprene tubing stripper; the upper section or bowl contains the slips and packing arrangement. The SOS is unsurpassed for use in well servicing operations in addition to its use in flowing wells.



HERCULES TYPE SO

TUBING HEAD

Hercules "Type SO" tubing head is actually the lower section of the "Type SOS" tubing head, containing the slips and packing arrangement. It is particularly suitable for pumping due to its compactness, being approximately 12 inches high.



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Reed Brazil Representative

Frank Semper (right) has joined the Reed Roller Bit Co. sales organization as Special Representative in Bahia, Brazil. Mr. Semper has 20 years experience in South America, in Argentina, Brazil, Chile and Venezuela, with service companies and with Mene Grande Oil Co. He will work with Reed Special Sales Representative Vladimir Edelberg of Buenos Aires. Mr. Semper is pictured with Mario J. Cueto, Reed Export vice president.

Halliburton Appointment

Francis N. Harris, who has been a member of the analytical section of Halliburton Oil Well Cementing Co.'s chemical research and development laboratories at Duncan, Okla., has joined the company's production improvements section as staff engineer, chemical services.

Heads Security Sales

Claude L. Griffin has been named vice president in charge of sales for Security Engineering Division, one of the Dresser industries. He has been domestic sales manager for Security since early in 1958. Active in the oil industry since 1933, Mr. Griffin formerly was vice president of American Iron and Machine Works Company, in charge of that firm's international sales.

C. L. Griffin

H. Roach

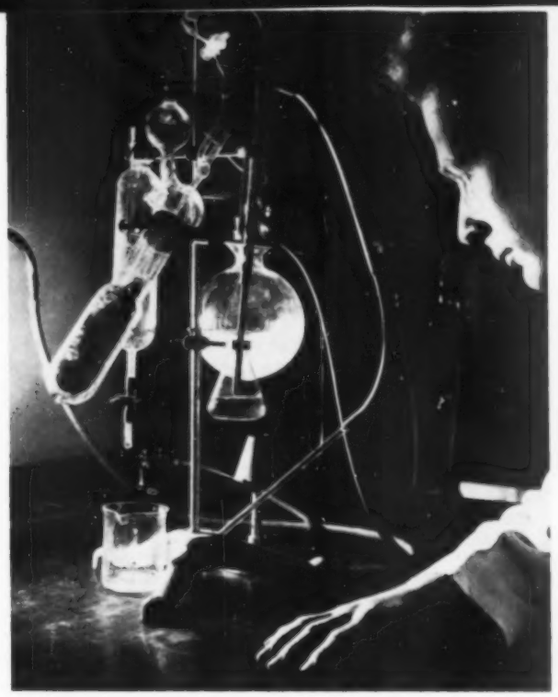
Heads European Sales

Garrett Oil Tools, division of U. S. Industries, Inc., has appointed C. M. Peters as vice president for sales engineering in charge of Garrett's operations in Europe and the sterling currency areas. Mr. Peters has served Garrett Oil Tools and its predecessor companies since 1938.

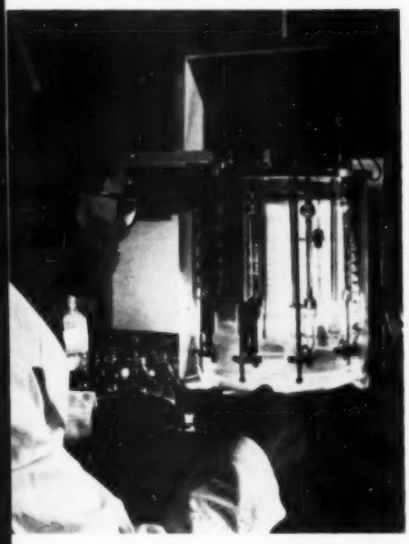
Expands South American Operations

United Oilwell Service, S.A., formerly a Dowell subsidiary operating in Venezuela, has transferred its assets and business to the Dowell division of The Dow Chemical International Ltd., S.A. No change in operations is contemplated under the Venezuelan corporation. Headquarters are located in Caracas.

In Argentina, Dowell services are offered by the Dowell division of Dow Quimica of Argentina, S.A. Offices for this company have been established in Buenos Aires and Comodoro Rivadavia.



Kjeldahl apparatus at Esso Research Center analytical laboratory for the determination of nitrogen, part of a comprehensive scheme for identifying unknown organic materials: Nitrogen in the original substance is converted into ammonia and distilled in the apparatus shown. The amount of ammonia, which is alkaline, is determined with standard acid.



Kinematic viscosity determination at 210 F at Esso inspection lab, Abingdon, England.

Esso opens new laboratory at Abingdon Research Center

Esso Research Ltd. has opened a new $2,800,000 main laboratory building at the firm's research center near Abingdon, England. The opening was marked by formal dedication ceremonies attended by 100 representatives of government, education, and industry.

The new building, under construction for a year and a half, replaces prefabricated concrete laboratories and offices which had been in use for the past 10 years. The new laboratory structure houses eight research labs, plus analytical and testing labs, a library, and extensive office space. These new facilities are in addition to labs used for work on radiotracers, automotive engines, knock rating, electronics, and polymers. There is also a pilot plant, plus auxiliary service buildings.

Esso Research Ltd., employing a staff of 400 persons, exists to investigate technical problems which arise in refining and marketing Esso products in Europe and North Africa. The company and the affiliated Esso Research and Engineering Co., in Linden, N. J., work as a trans-Atlantic team, with full interchange of all technical information. In 1957, the two companies spent about $55 million in their research efforts.

The English research organization was set up in the mid-30's as the Esso European Laboratories. The name was changed to Esso Development Co. Ltd. in 1946, and to Esso Research Ltd. in 1956. Its headquarters are in London, 60 miles from Abingdon. Charles S. Windebank is managing director.

END

Main laboratory building: at Esso Research Center, Abingdon, England.

A Real 'Bit' Of A Record

A total of 6,770 ft with one bit—that is the record being pointed to here by S. W. Jack (left) of the S. W. Jack Drilling Co., Inc., Avonmore, Pa., in the company of Howard B. Book of Houston, senior vice president, Reed Roller Bit Co. Mr. Jack's Pennsylvania rig drilled with air on the record setting project, using a Reed YC-3 Cobra Bit. The 6,770 ft drilled by the Reed bit represented the entire 8¾-inch portion of the hole all the way to completion.

New OECC Publications

Economic Development of Overseas Countries and Territories Associated with OEEC Member Countries. By the OEEC (Organization for European Economic Co-operation). General economic review of territories in Africa, etc. including overseas territories of the United Kingdom, Belgium, France, Italy, the Netherlands, and Italy. Little about oil but excellent for general economic information. 273 pages. $3.50 per copy. Available from OEEC in Paris or at 1346 Connecticut Ave., N.W., Washington 6, D.C.

Gas in Europe. A study by the Gas Committee of the OEEC. Detailed study by country of production and use of gas. Considerable number of statistical annexes and map of long distance gas transmission systems in Europe. 146 pages. $2.00 per copy. Available from OEEC in Paris or Washington (see above).

Drainage and Use of Methane from Coal Fields. By OEEC. Covers developments since 1956. Review by country, with different national authors. 114 pages. $1.00 per copy. Available from OEEC in Paris or Washington (see above).

Industrial Foam Solvent

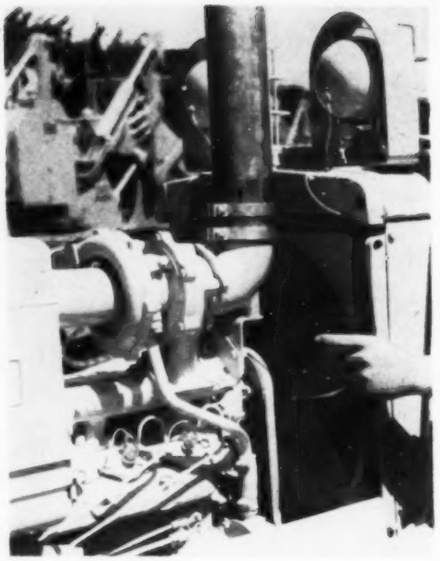
Research chemists for the Dowell division of The Dow Chemical Co. in Tulsa have announced a method of making a chemical lather that may revolutionize the cleaning of industrial equipment. The foam solvent is pumped directly into the tank, pipe or tower to be cleaned. When the vessel, or tank, is filled with the chemical foam, the process continues with the foam passing into a foam breaker and a filter which removes the material dislodged by the movement of the foam through the equipment. The solvent is then recycled through the foam generator and the unit being cleaned. Routine tests tell when the job is finished.

Trinidad Representative

Brown Oil Tools, Inc. has announced the appointment of Hugh J. Gransaull and Co., Ltd., as the exclusive representative in Trinidad, B.W.I., for Brown equipment.

Smallest Turbocharger Announced

The smallest turbocharger now in production—no larger than a salad plate and weighing only 24 pounds—has been developed for use on the new International TD-9 crawler tractor. Fitted to the recently-announced International D-282 six-cylinder diesel engine, the 7¾-inch-diameter turbocharger boosts power output by 23% over that of a naturally-aspirated engine.



Small, spiral-shaped turbocharger developed for use on International TD-9 crawler tractor.

Tretolite V. P. Elected

Louis T. Monson, general manager of Tretolite Co. of California division of Petrolite Corp., has been named a vice president of Petrolite. Prior to his appointment as general manager of Tretolite Co. of California in December of 1957, Mr. Monson had served as chief chemist and research director of the California division.

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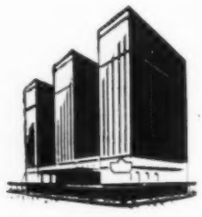


Houston's Welcome to the World

Magne Returns To Paris

Five high-level promotions and reassignments have been announced by the Schlumberger Well Surveying Corp., including the promotion of Louis E. Magne from Schlumberger southwest area manager in Houston, to vice president of operations of Societe de Prospection Electrique at Paris. The latter organization is Schlumberger's operating company for Europe, the Middle and Far East.

Thus, the promotion will return Mr. Magne to his native France. Mr. Magne has served Schlumberger in Romania, Venezuela and in many United States locations.

Alan Morazzani, formerly Rocky Mountain area manager in Denver, replaces Mr. Magne in Houston. W. R. Mills, Jr. has been promoted to Rocky Mountain area manager in Denver.

L. C. Chappel is now division manager of the Oklahoma division at Oklahoma City. He was formerly assistant to the vice president, Schlumberger of Canada. J. L. Heath has been assigned as assistant to the manager of the Mid-Continent area at Tulsa. Formerly, he was Oklahoma Division Manager.

L. C. Chappel

J. L. Heath

Heads Mission Foreign Sales

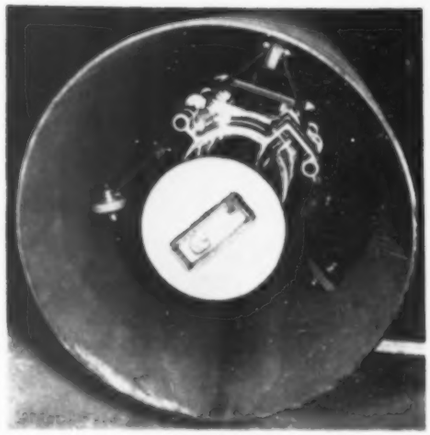
The appointment of W. C. Talbert as director of foreign sales for the Mission Manufacturing Co. with headquarters in Houston, Texas, has been announced by Mission President Richard E. White. Mr. Talbert's recent assignment was sales manager for the Mission Manufacturing Co., Ltd., with offices in London. His new duties include direction of the sales effort in all areas excepting U.S., Canada and Mexico.

L. E. Magne

A. Morazzani

W. R. Mills

W. C. Talbert

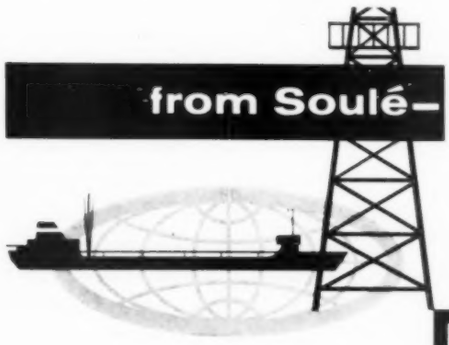


High Speed Pipe X-Ray

A new machine which can radiograph every inch of every weld in a 40-foot length of pipe in less than one minute has been announced by the Travel-Ray Corp., Houston. The new equipment incorporates an X-ray tube of patented design which projects a narrow beam of parallel rays only, permitting radiography of the longitudinal welds in pipe sections while the X-ray source is in motion. The relative speed of the machine virtually eliminates the "scatter" radiation problem inherent in stationary radiography by conventional techniques. Sensitivities of 1 to 1.5% are obtained as a result.

Heads South American Sales

Garrett Oil Tools, division of U.S. Industries, Inc., has appointed K. J. Walker as manager of South American sales with Caracas headquarters.



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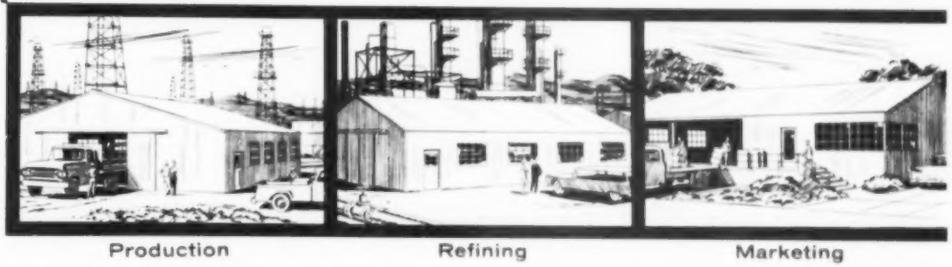

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Low-cost Soulé Buildings are versatility-engineered to fit any petroleum industry need. Rugged, clear-span steel frames offer maximum work, equipment or storage areas. Frames are pre-engineered to handle a wide range of crane loads. Heavy-duty hi tensile industrial corrugated sheets provide low maintenance, protection from weather, pilferage.

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